# Supplemental Material: Additional Figures

# Part 2: EMAC simulations S-E4CHEM, S-MECCA(E4CHEM) and S-MECCA(EVAL)

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Date: 2009/12/15

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**9 Species: $N_2O$** **51**

**10 Species: NOx** **57**

**11 Species: $O_3$** **63**

**12 Total column ozone** **69**

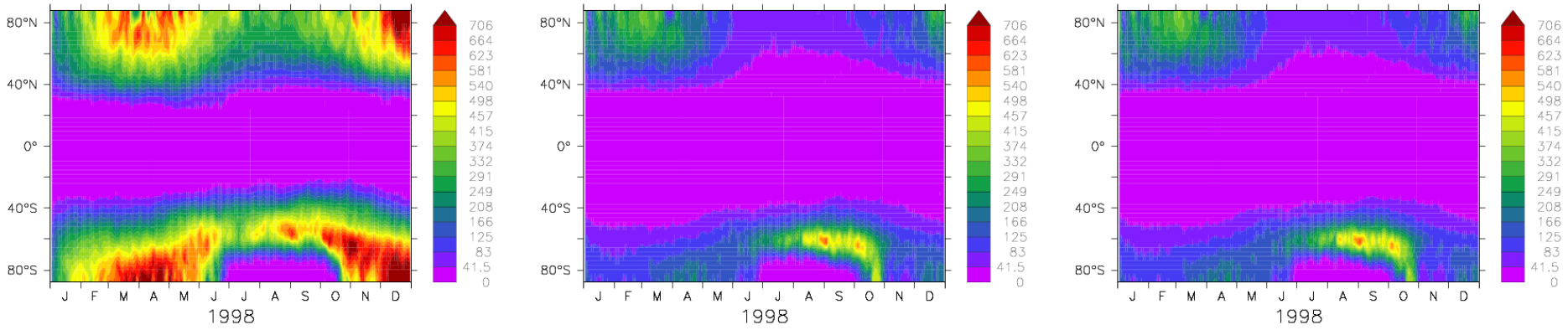
# 1 Species: $ClONO_2$

S-E4CHEM

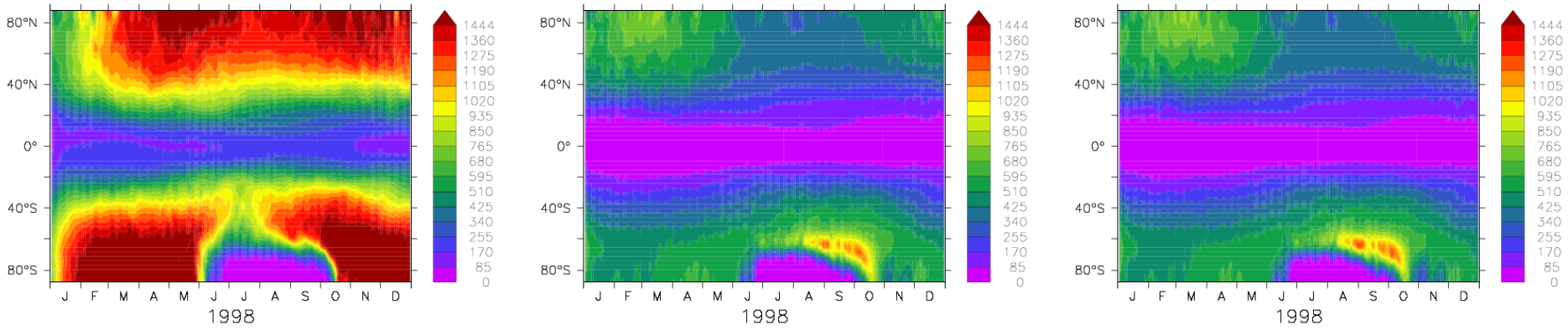
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean ClNO3 at 100 hPa, [pptv]




zonal mean ClNO3 at 50 hPa, [pptv]

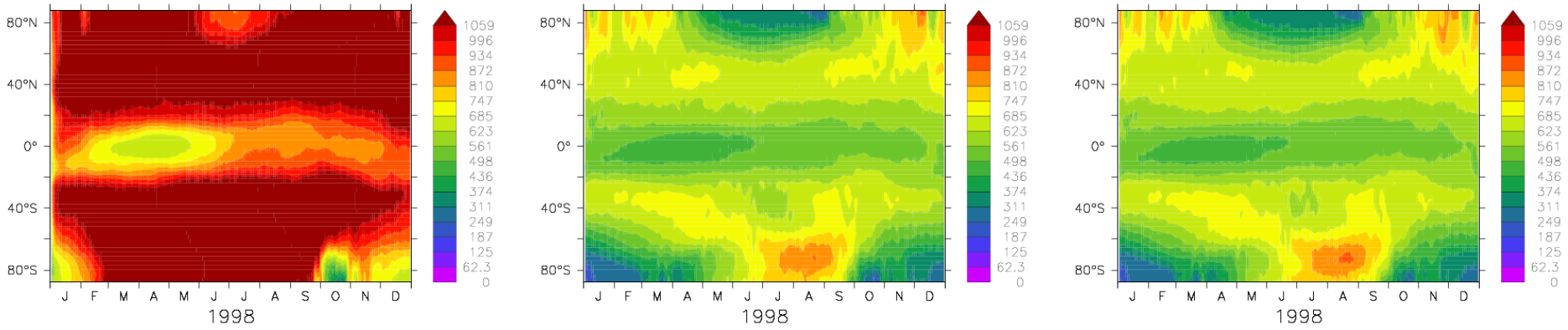


S-E4CHEM

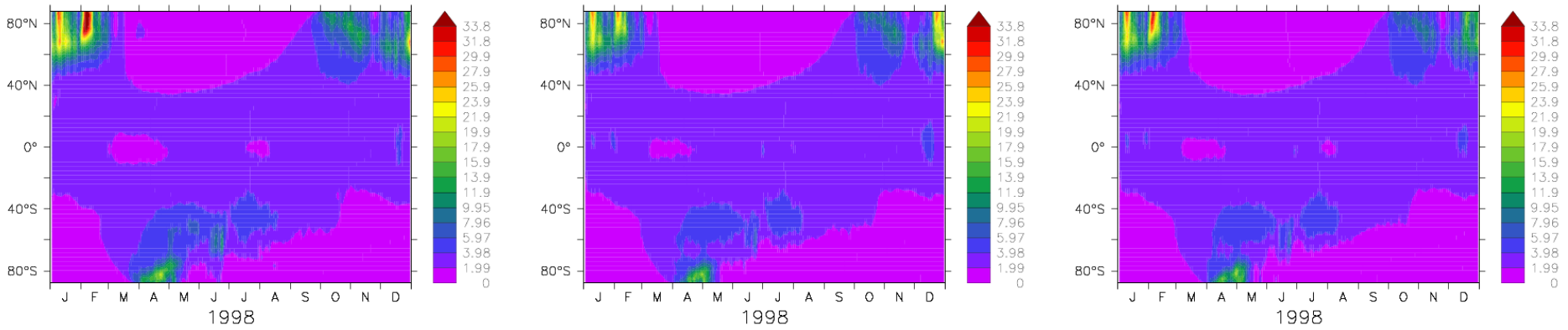
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean ClNO3 at 10 hPa, [pptv]




zonal mean ClNO3 at 1 hPa, [pptv]

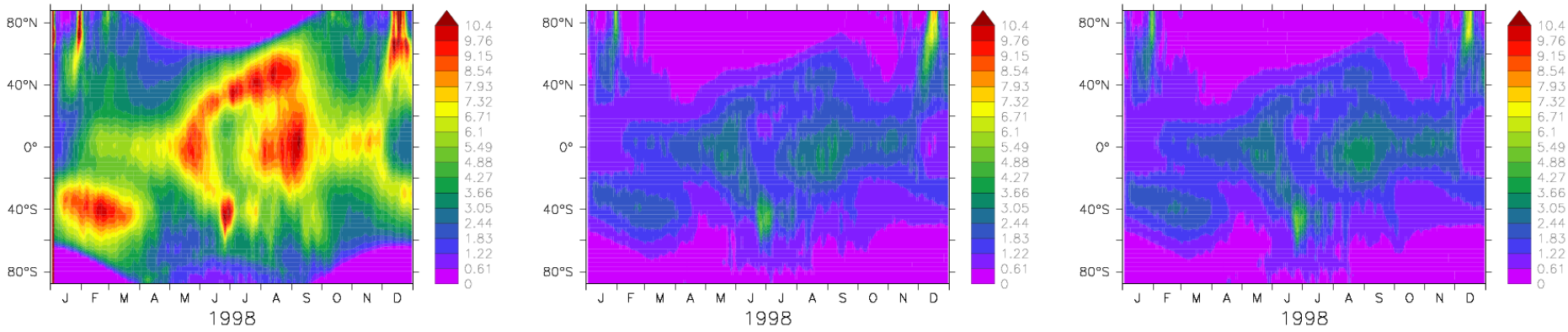


S-E4CHEM

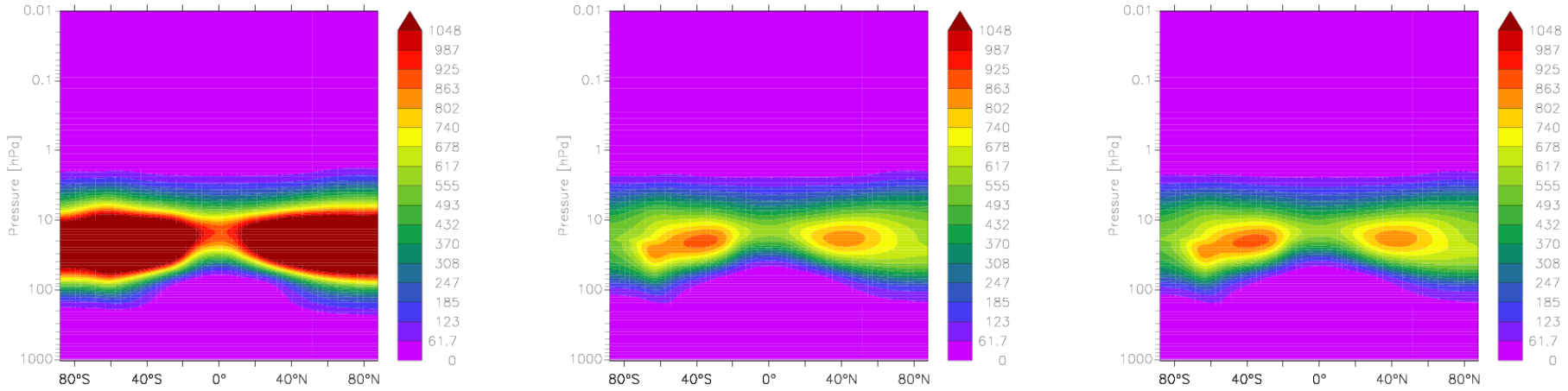
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean ClNO3 at 0.1 hPa, [ppqv]




zonal mean ClNO3 at t=1-Jan-1998:31-Dec-1998, [pptv]



S-E4CHEM

S-MECCA(E4CHEM)

S-MECCA(EVAL)

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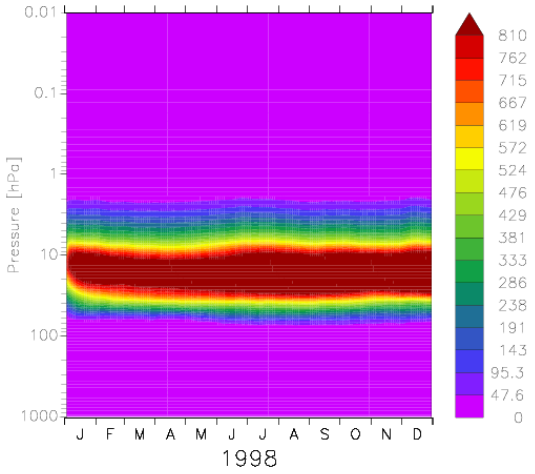
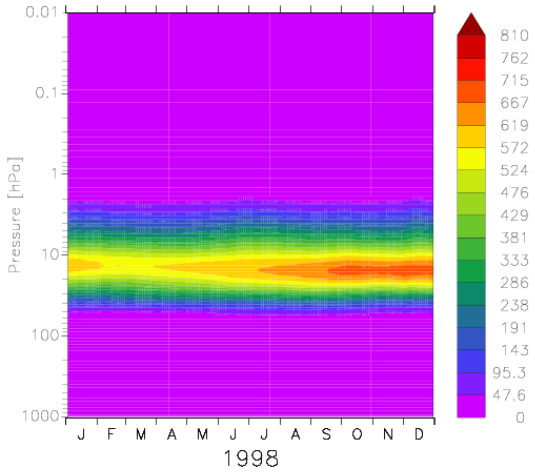
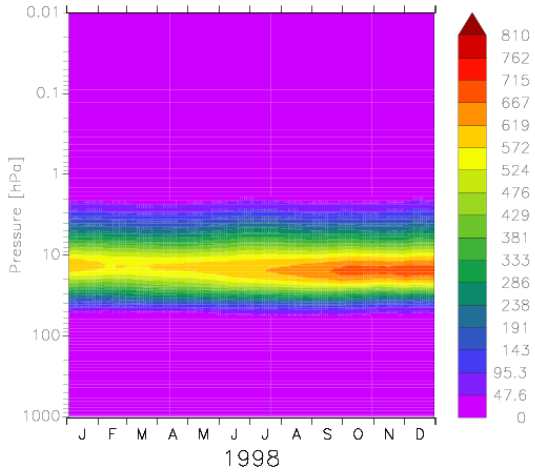
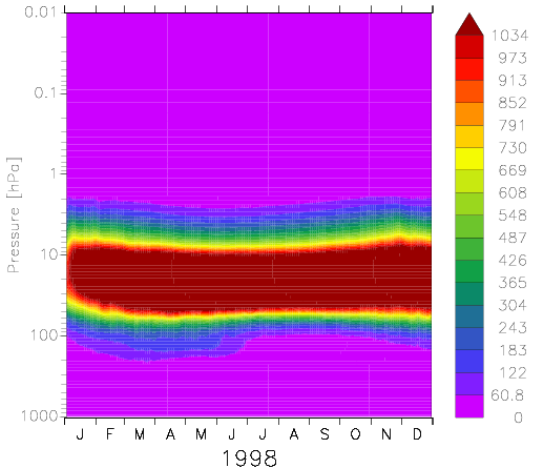
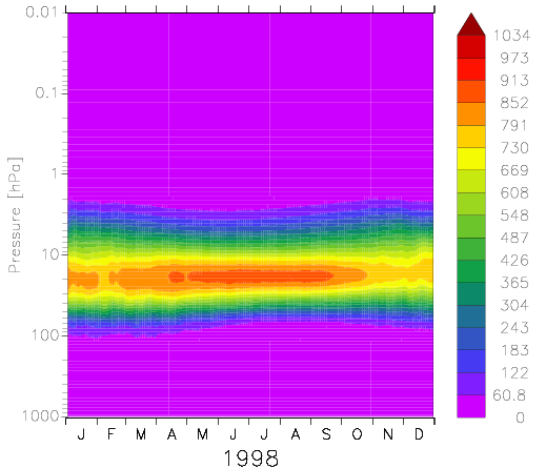


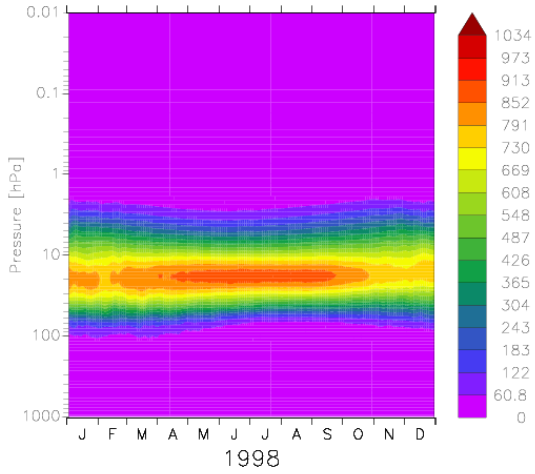




zonal mean ClNO3 at 30N-50N, [pptv]



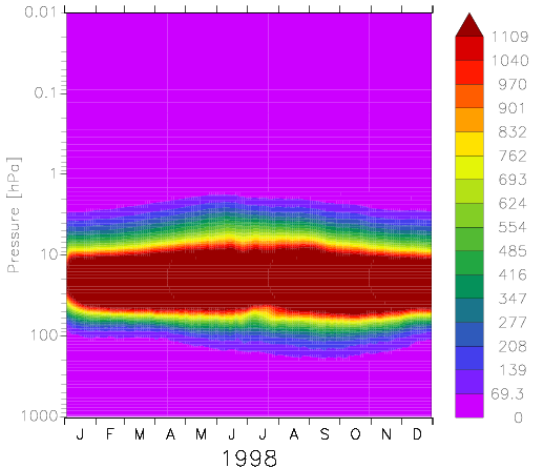



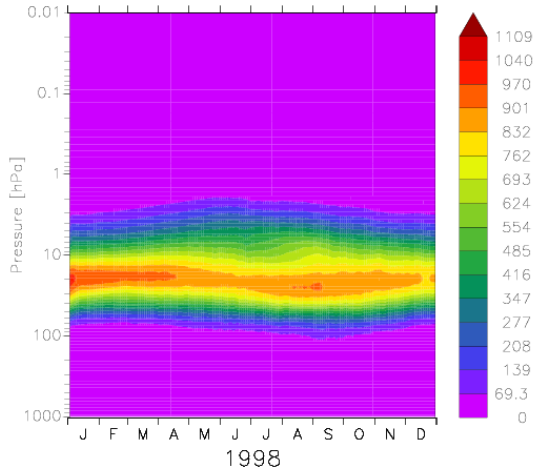
S-E4CHEM

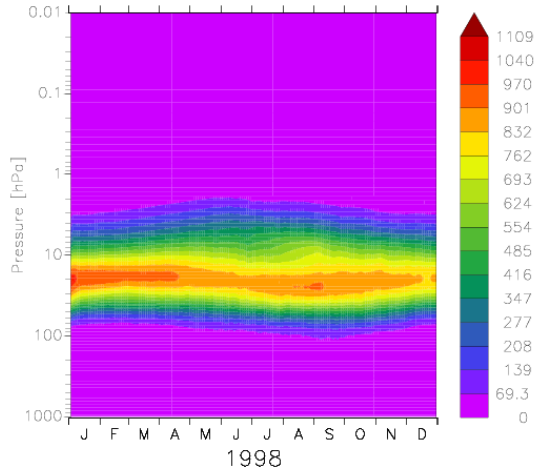
S-MECCA(E4CHEM)

S-MECCA(EVAL)

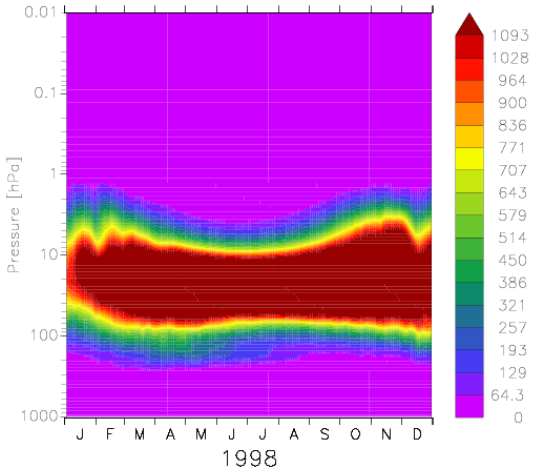
zonal mean ClNO3 at 30S-50S, [pptv]

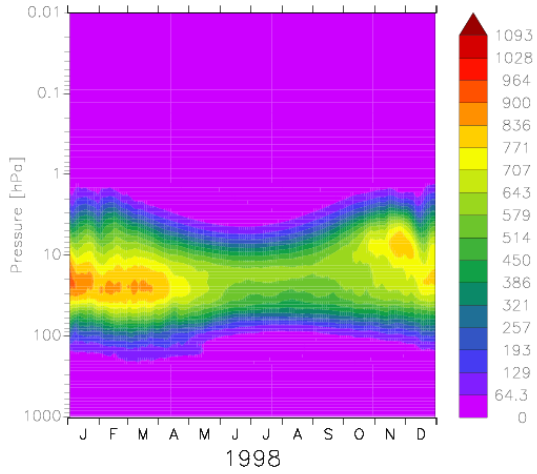


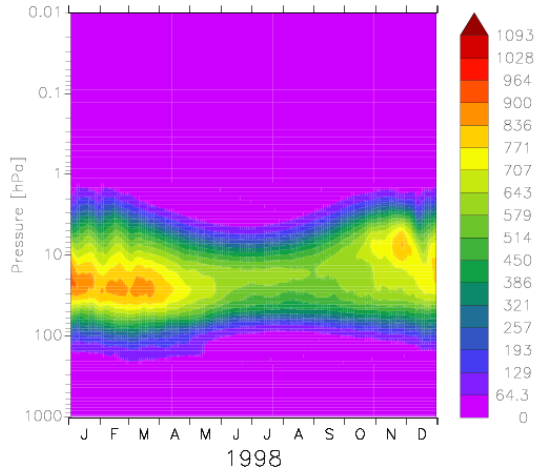




zonal mean ClNO3 at 60N-90N, [pptv]



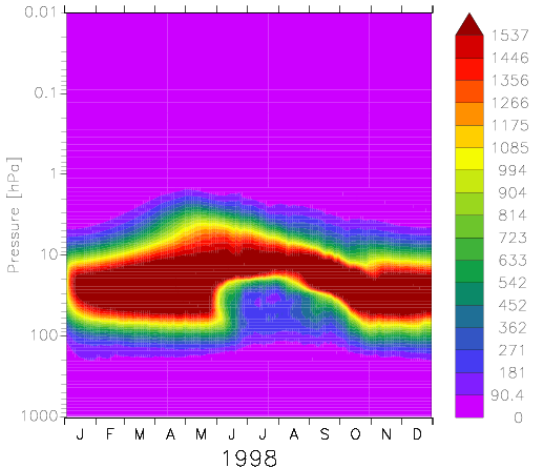



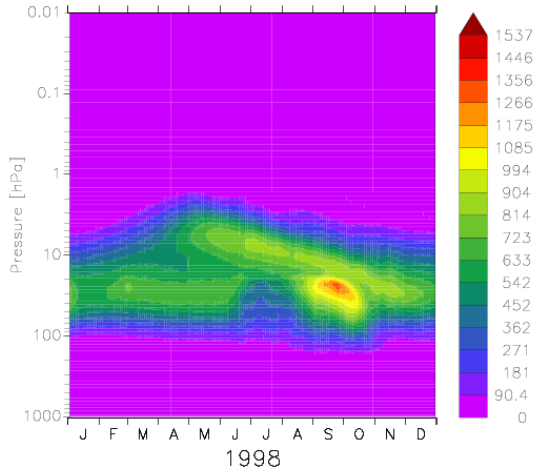
S-E4CHEM

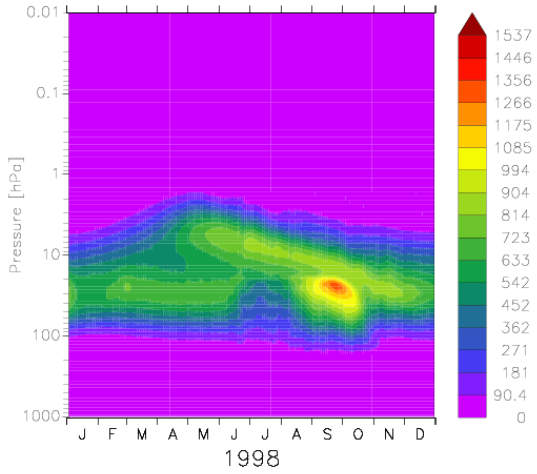
S-MECCA(E4CHEM)

S-MECCA(EVAL)

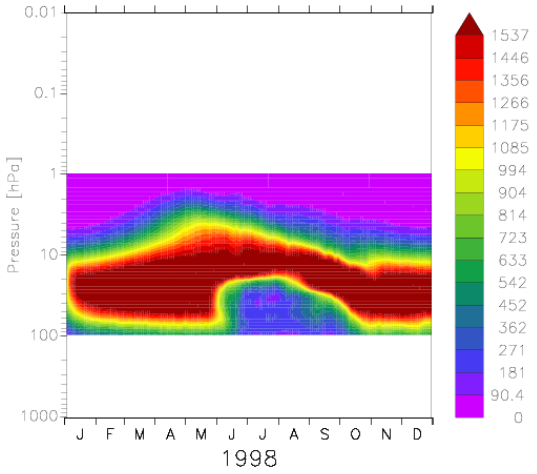
zonal mean ClNO3 at 60S-90S, [pptv]

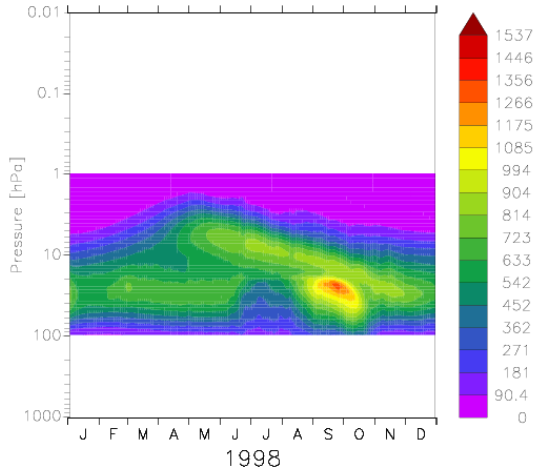


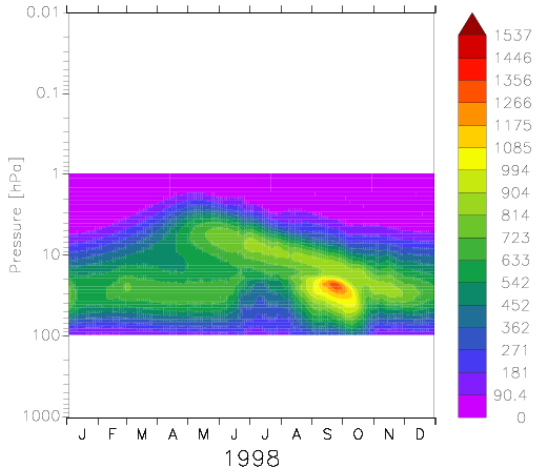




zonal mean ClNO3 at 60S-90S, [pptv]



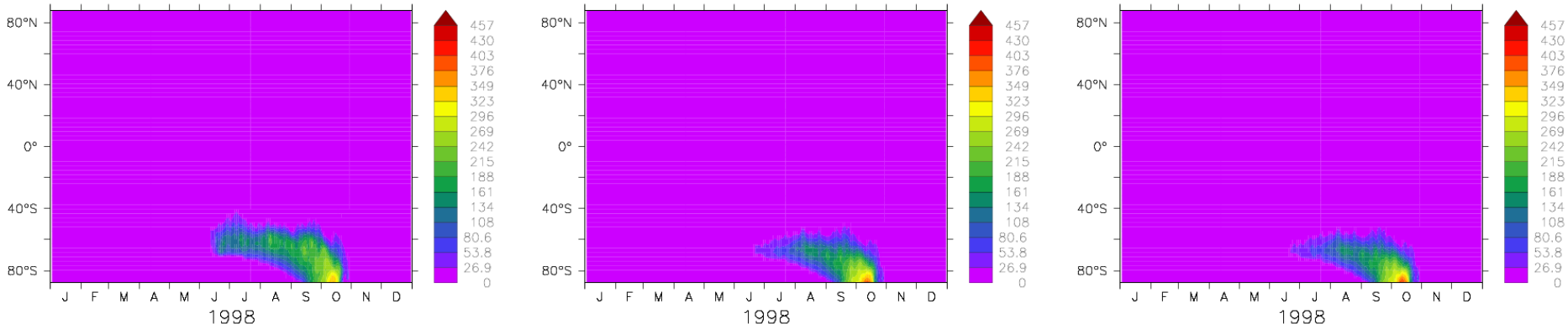
## 2 Species: ClO

S-E4CHEM

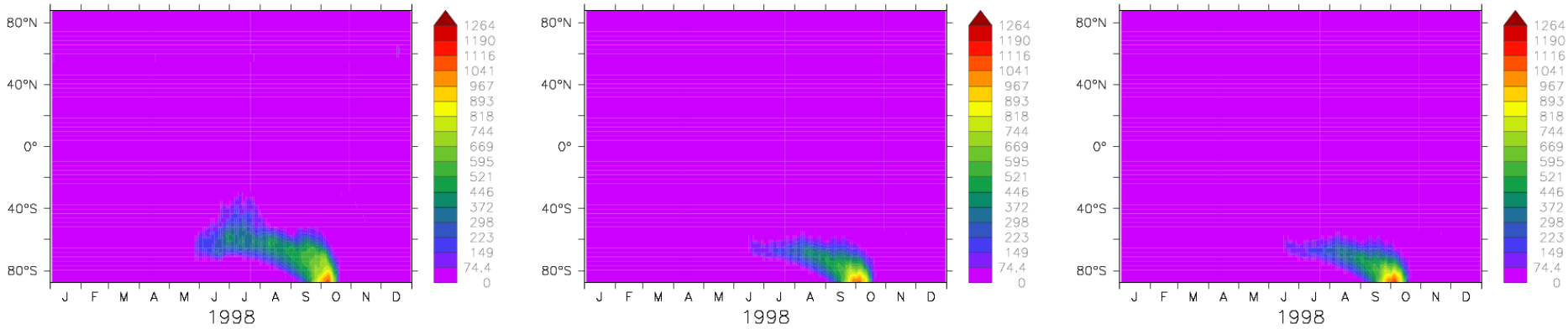
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean ClO at 100 hPa, [pptv]




zonal mean ClO at 50 hPa, [pptv]

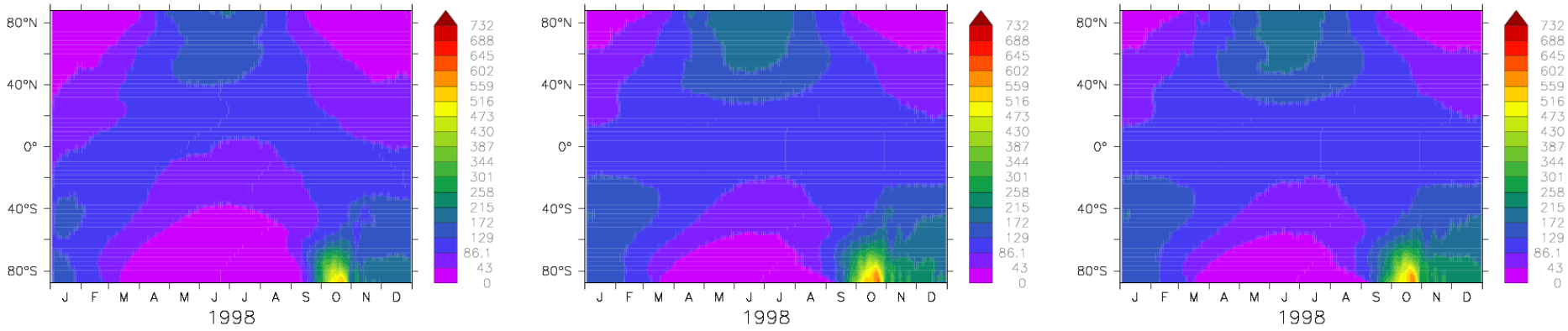


S-E4CHEM

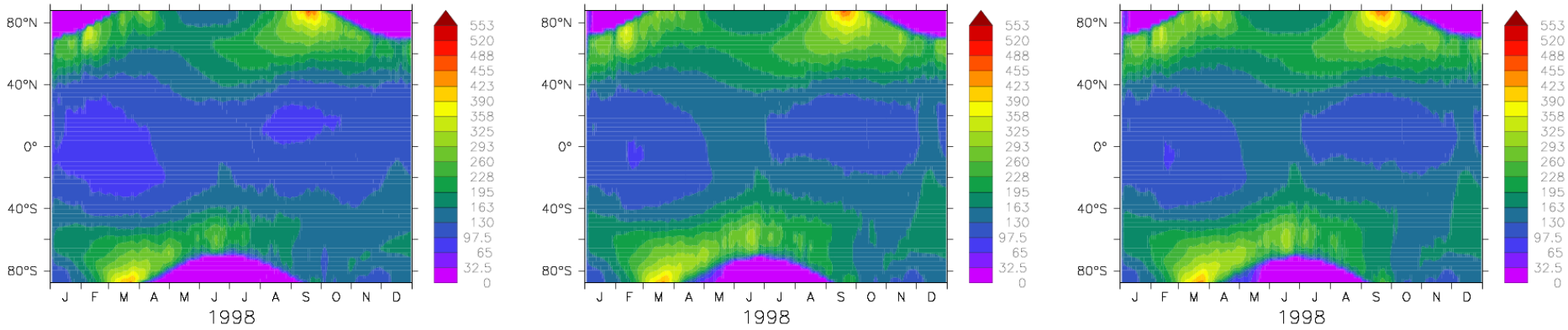
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean ClO at 10 hPa, [pptv]




zonal mean ClO at 1 hPa, [pptv]

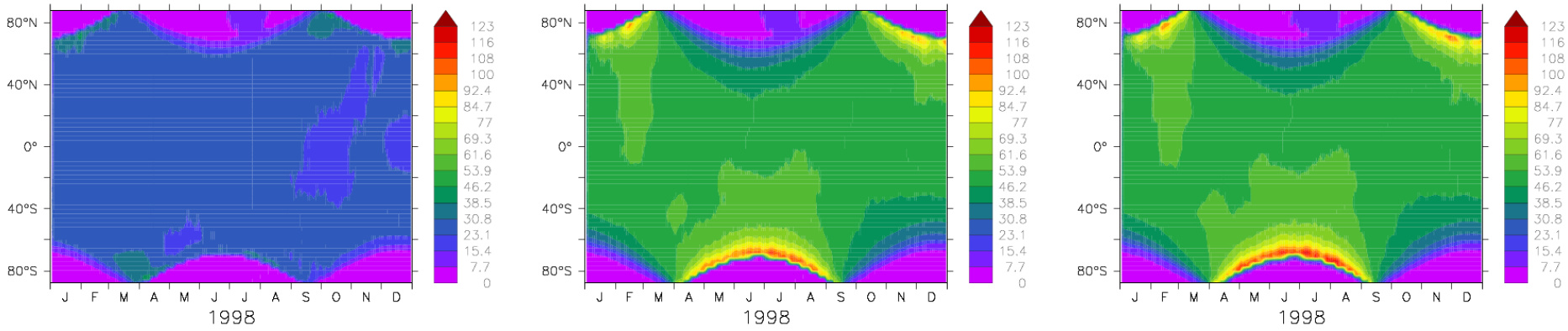


S-E4CHEM

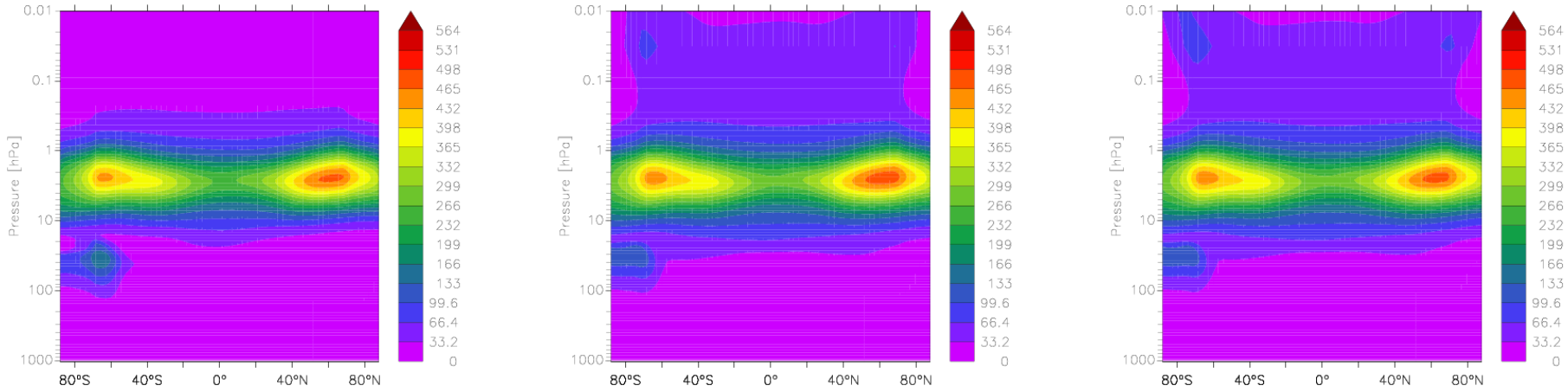
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean ClO at 0.1 hPa, [pptv]




zonal mean ClO at t=1-Jan-1998:31-Dec-1998, [pptv]

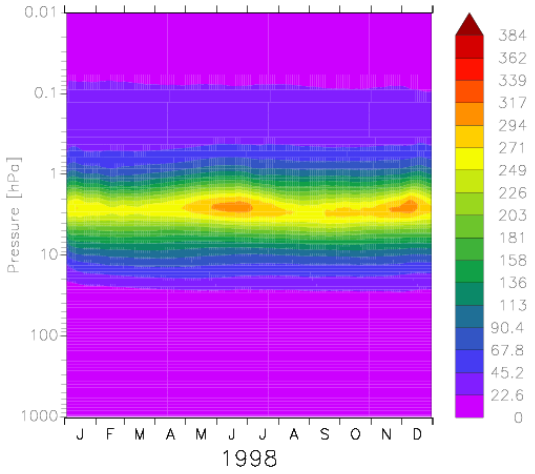


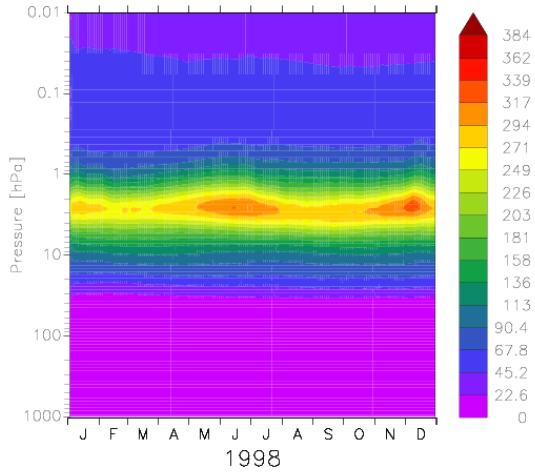
S-E4CHEM

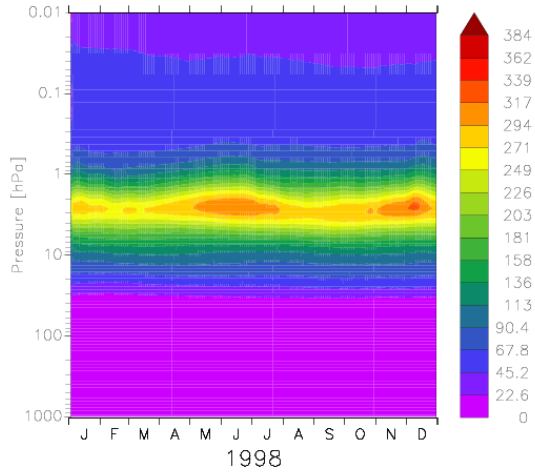
S-MECCA(E4CHEM)

S-MECCA(EVAL)

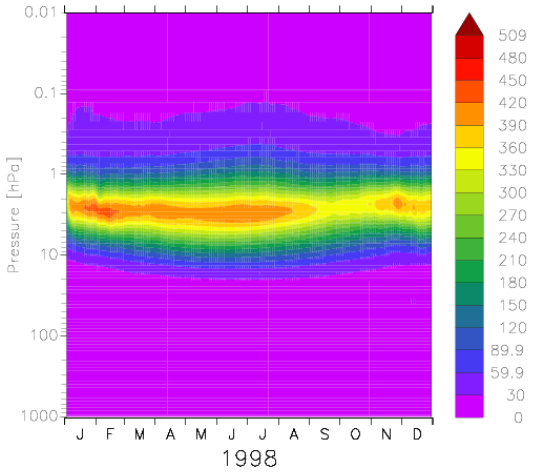
zonal mean ClO at 20S-20N, [pptv]

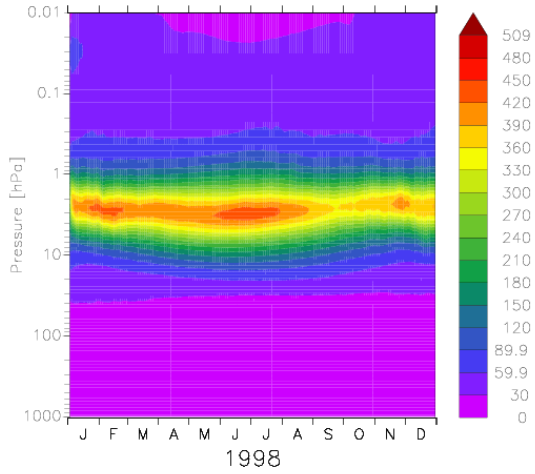


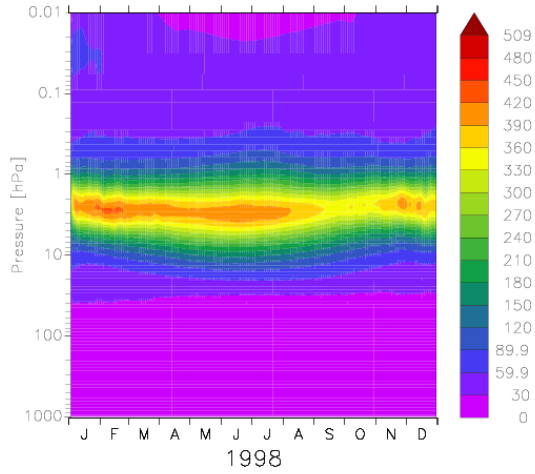




zonal mean ClO at 30N-50N, [pptv]



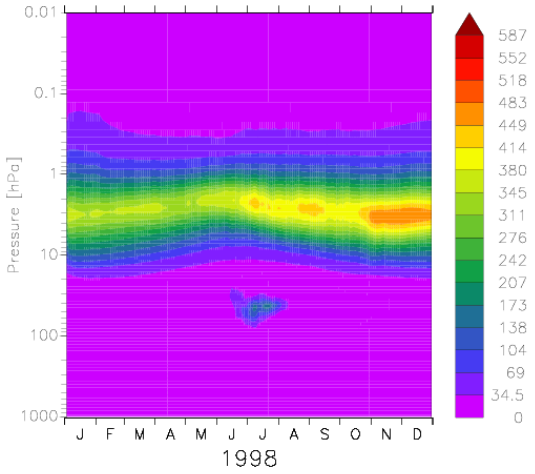



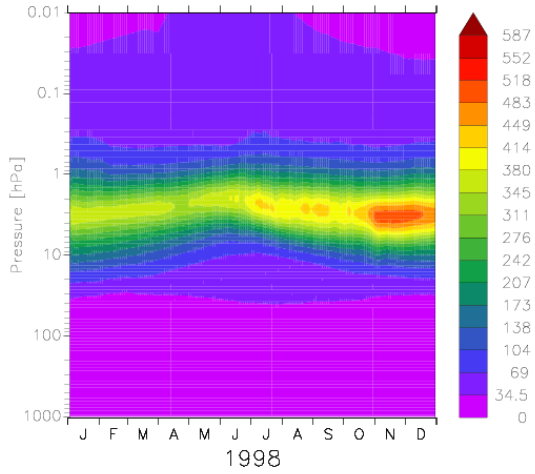
S-E4CHEM

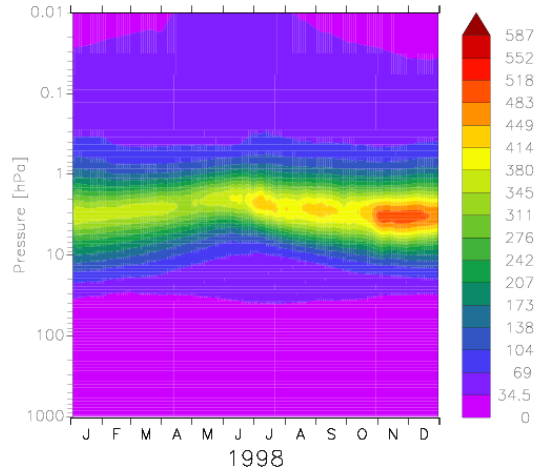
S-MECCA(E4CHEM)

S-MECCA(EVAL)

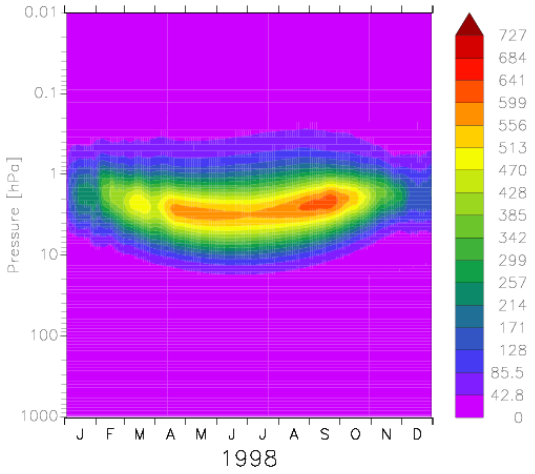
zonal mean ClO at 30S-50S, [pptv]

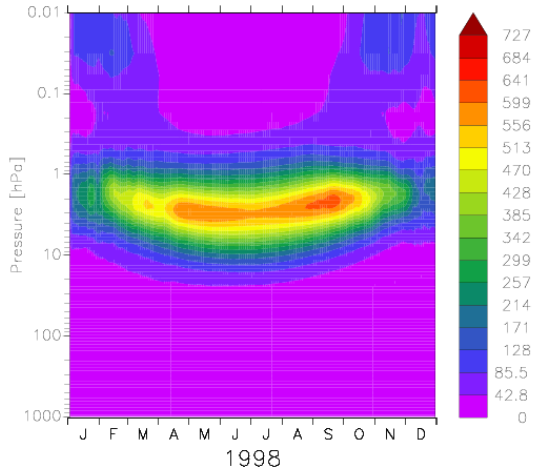


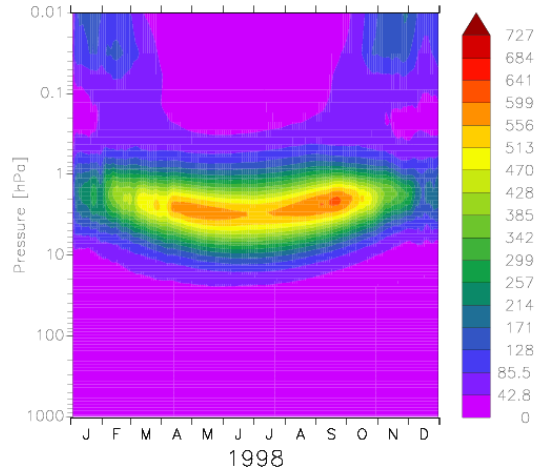




zonal mean ClO at 60N-90N, [pptv]



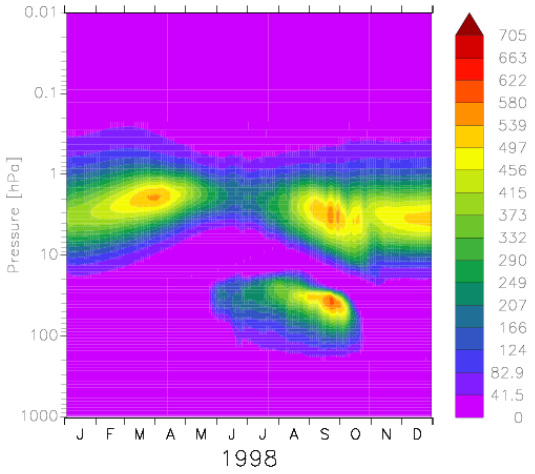



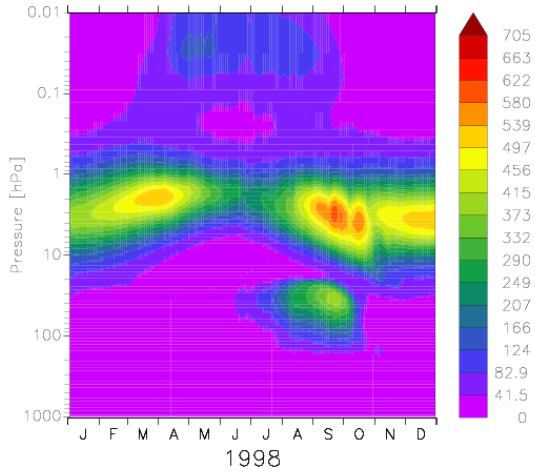
S-E4CHEM

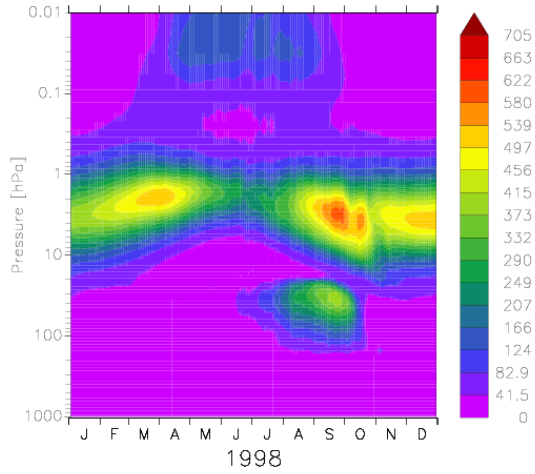
S-MECCA(E4CHEM)

S-MECCA(EVAL)

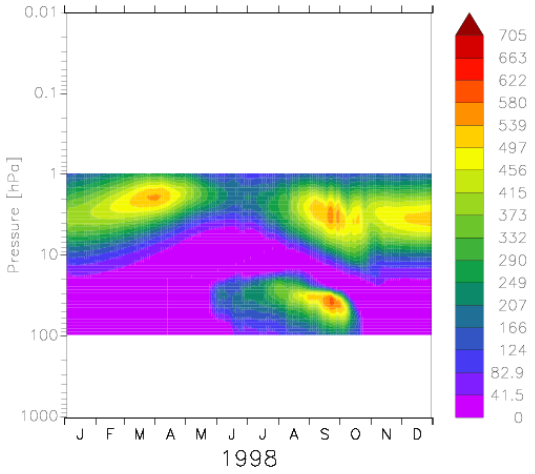
zonal mean ClO at 60S-90S, [pptv]

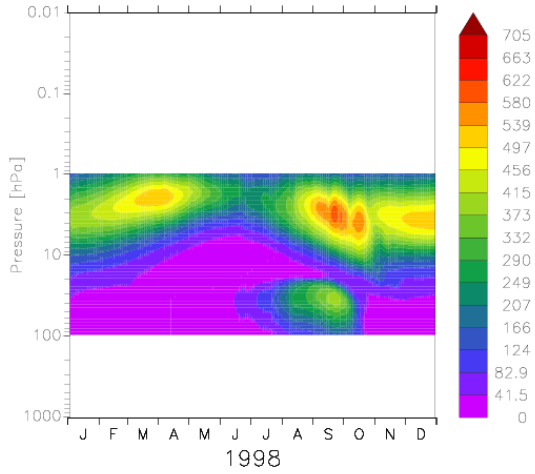


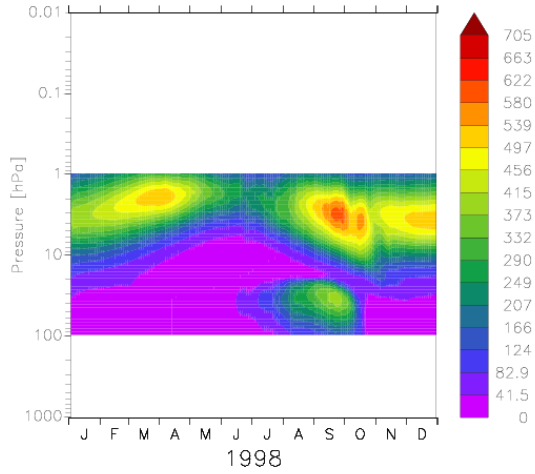




zonal mean ClO at 60S-90S, [pptv]



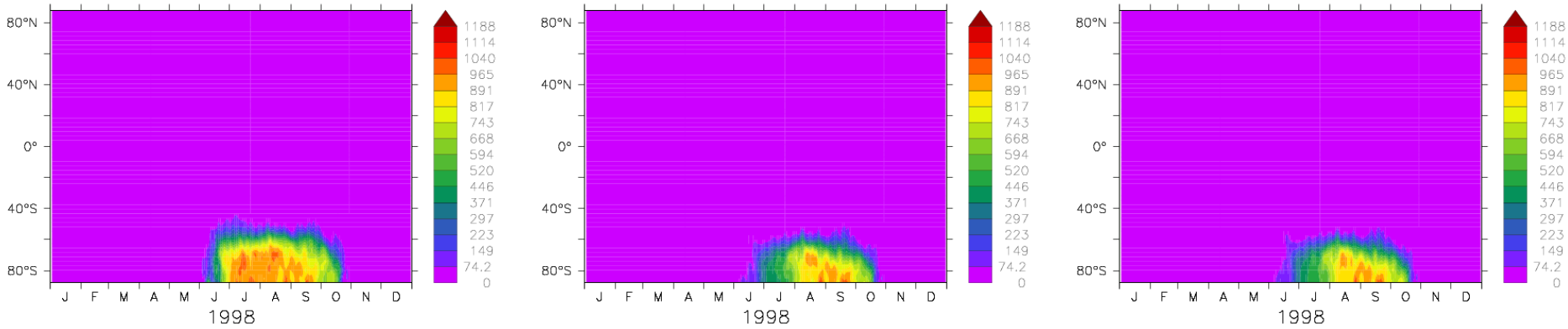
# 3 Species: ClOX

S-E4CHEM

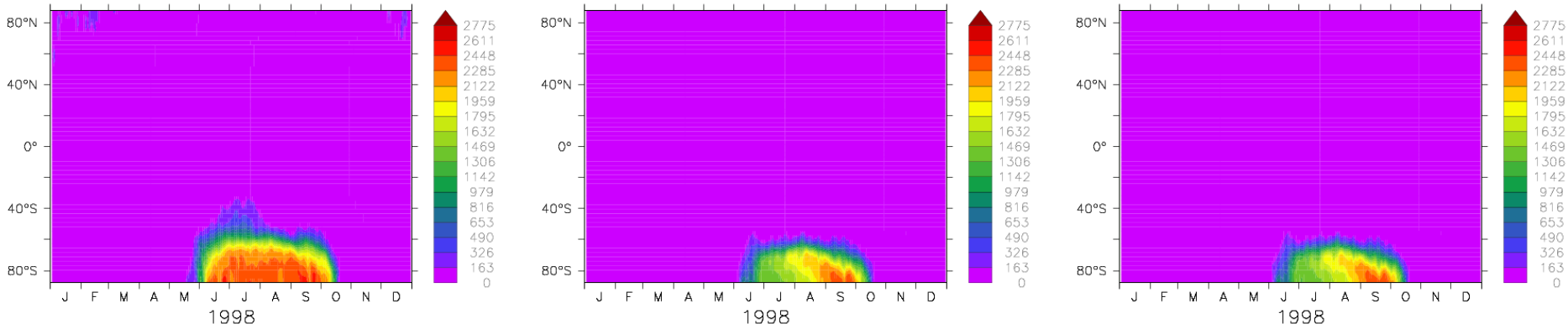
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean ClOX at 100 hPa, [pptv]




zonal mean ClOX at 50 hPa, [pptv]

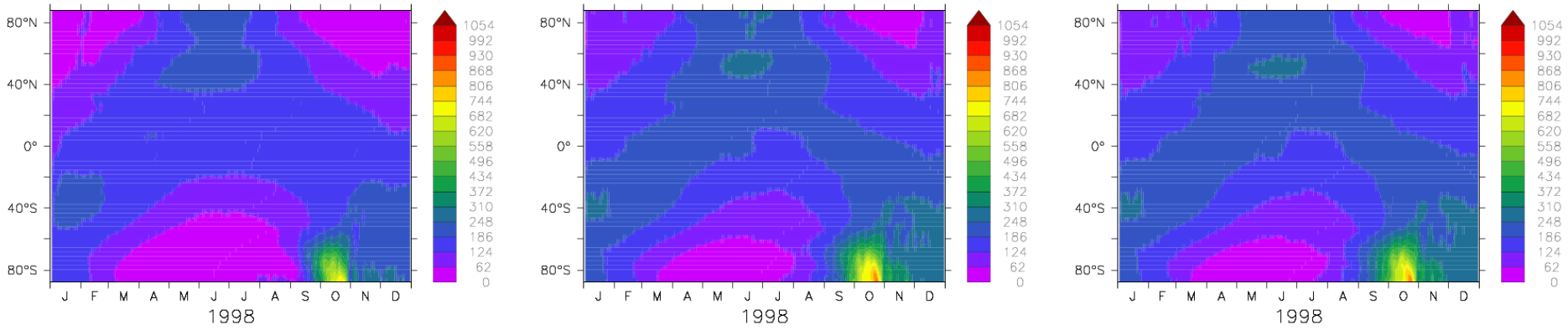


S-E4CHEM

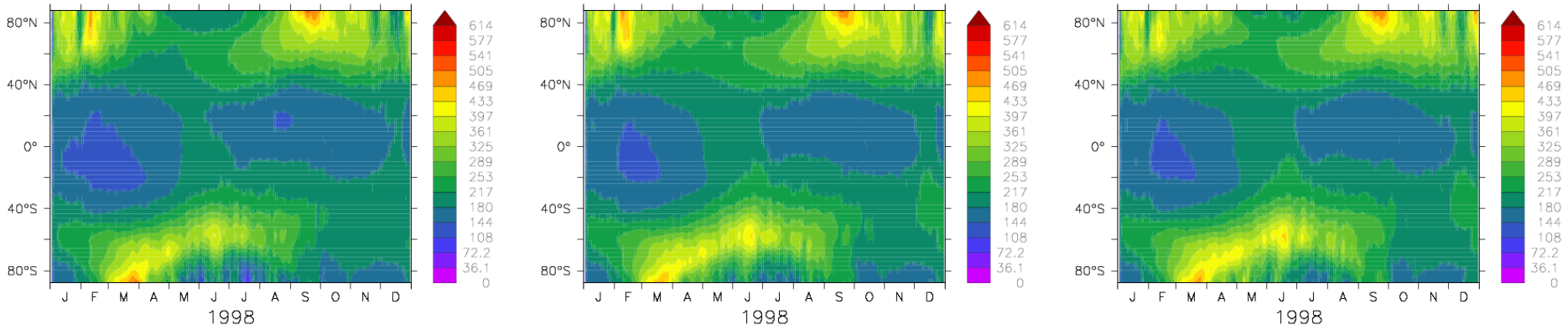
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean ClOX at 10 hPa, [pptv]

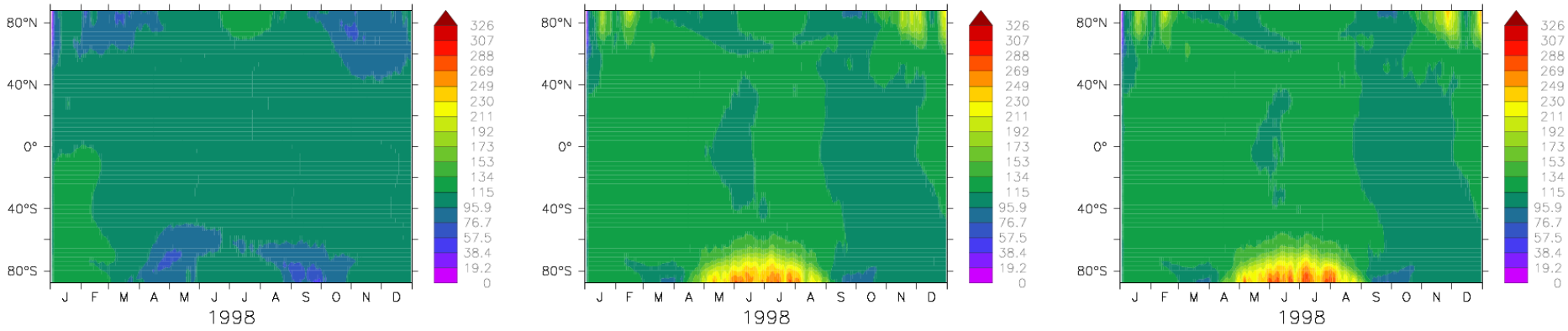



zonal mean ClOX at 1 hPa, [pptv]

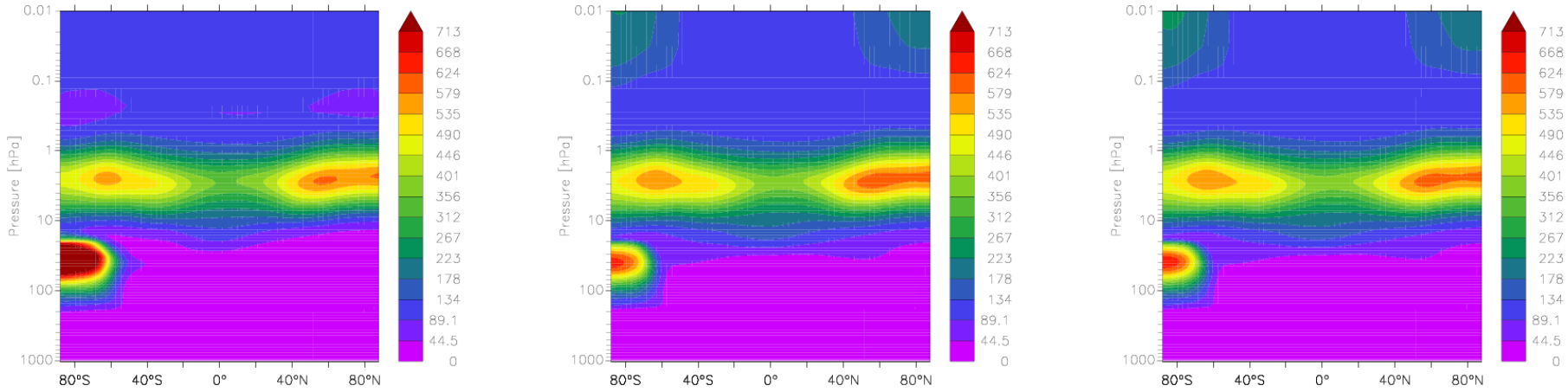


S-E4CHEM | S-MECCA(E4CHEM) | S-MECCA(EVAL)

zonal mean ClOX at 0.1 hPa, [pptv]




zonal mean ClOX at t=1-Jan-1998:31-Dec-1998, [pptv]

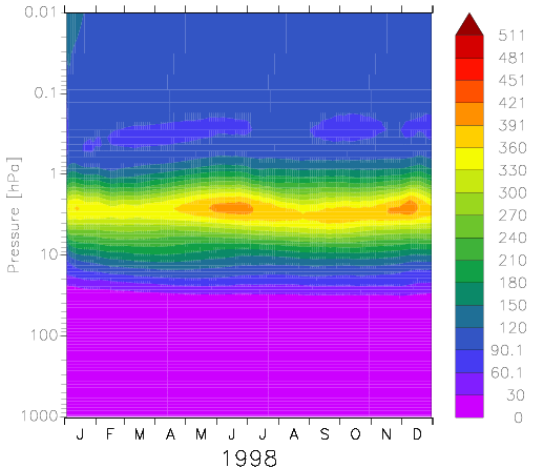


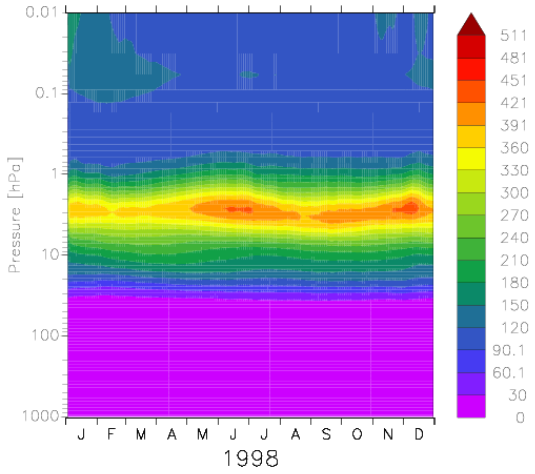
S-E4CHEM

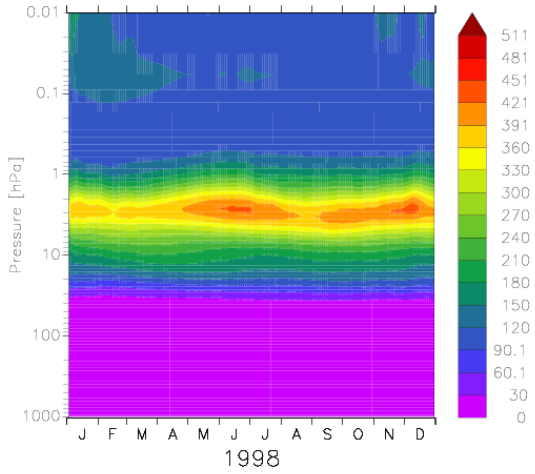
S-MECCA(E4CHEM)

S-MECCA(EVAL)

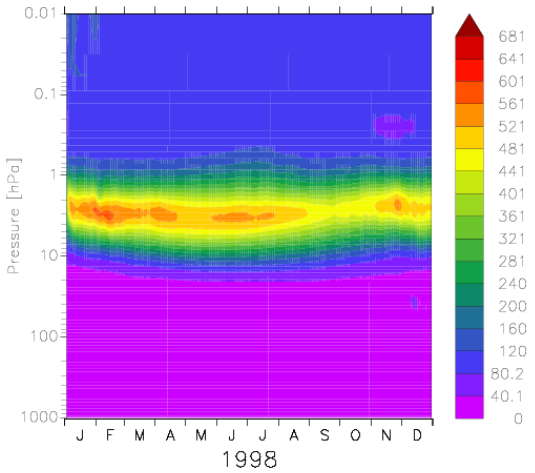
zonal mean ClOX at 20S-20N, [pptv]

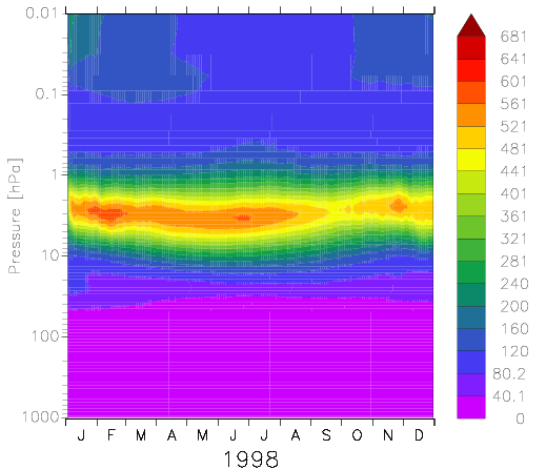


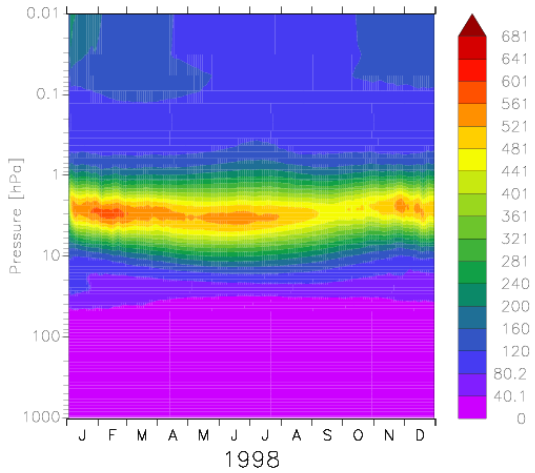




zonal mean ClOX at 30N-50N, [pptv]



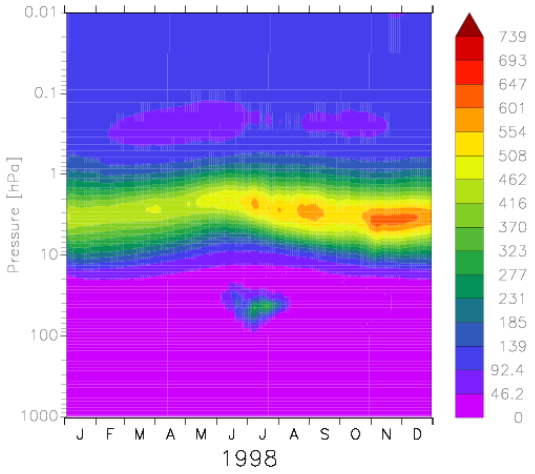



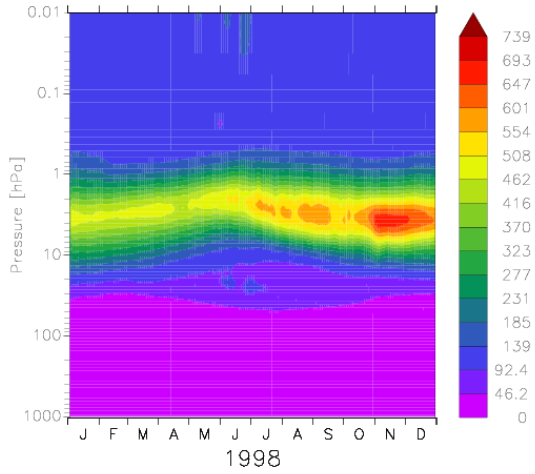
S-E4CHEM

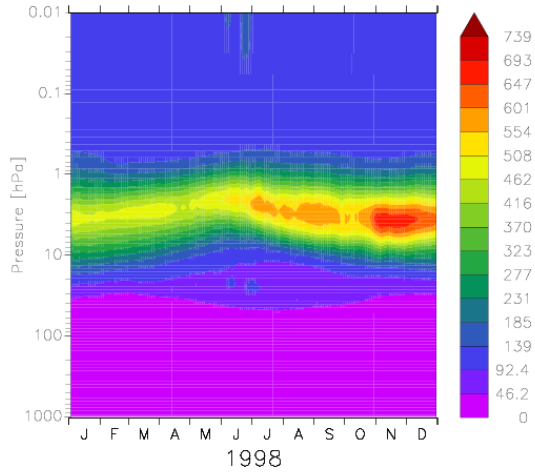
S-MECCA(E4CHEM)

S-MECCA(EVAL)

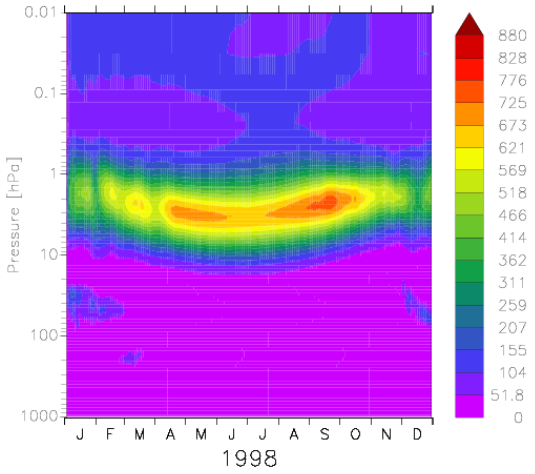
zonal mean ClOX at 30S-50S, [pptv]

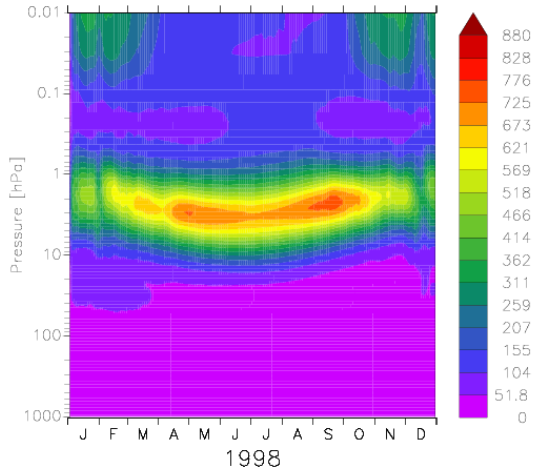


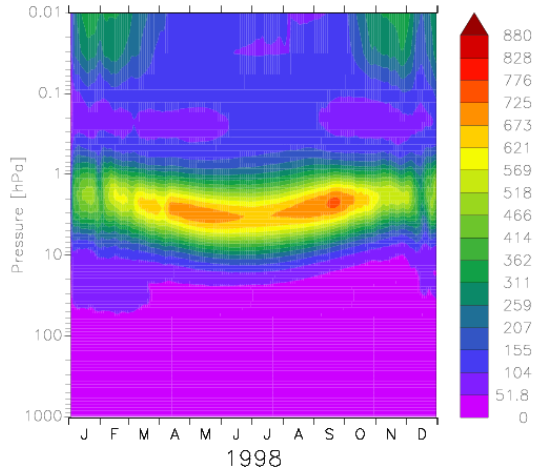




zonal mean ClOX at 60N-90N, [pptv]



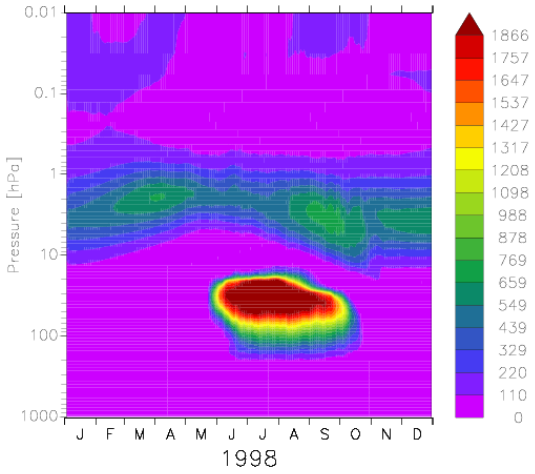



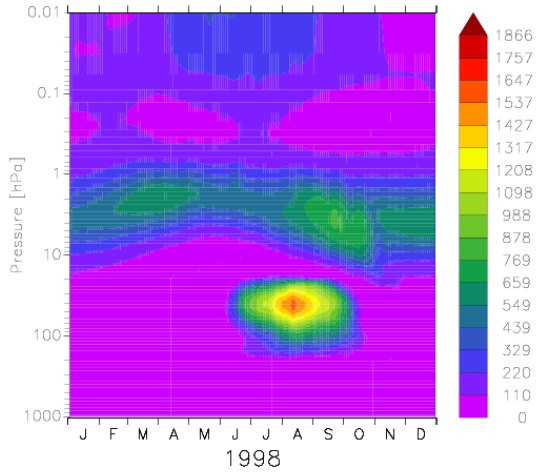
S-E4CHEM

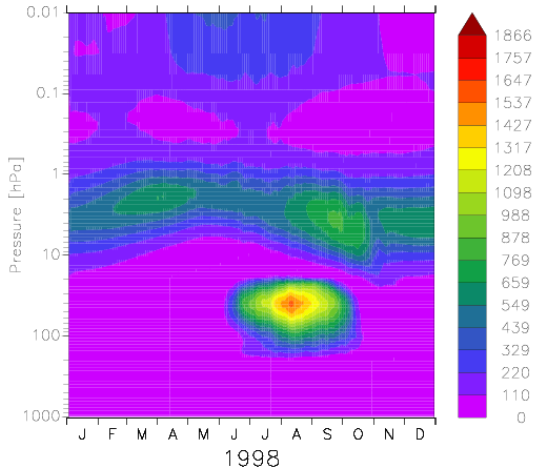
S-MECCA(E4CHEM)

S-MECCA(EVAL)

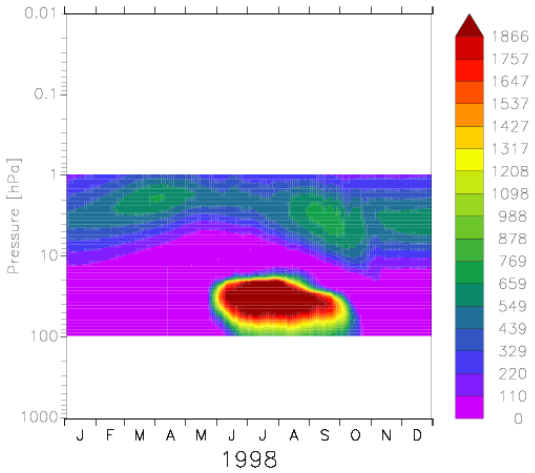
zonal mean ClOX at 60S-90S, [pptv]

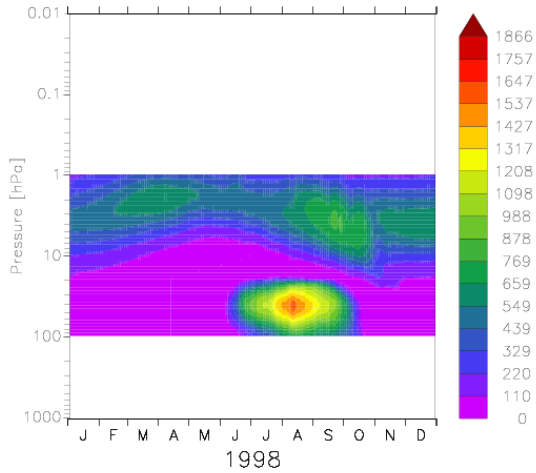


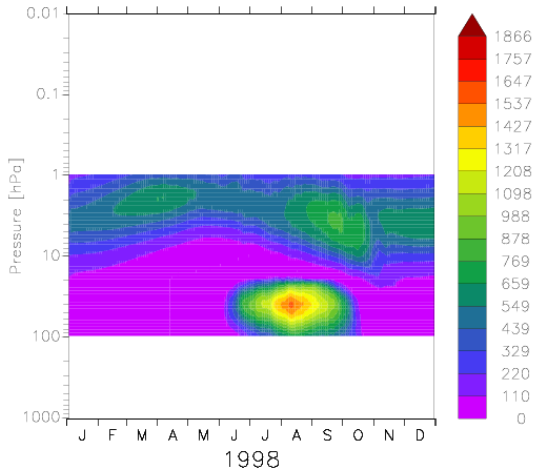




zonal mean ClOX at 60S-90S, [pptv]



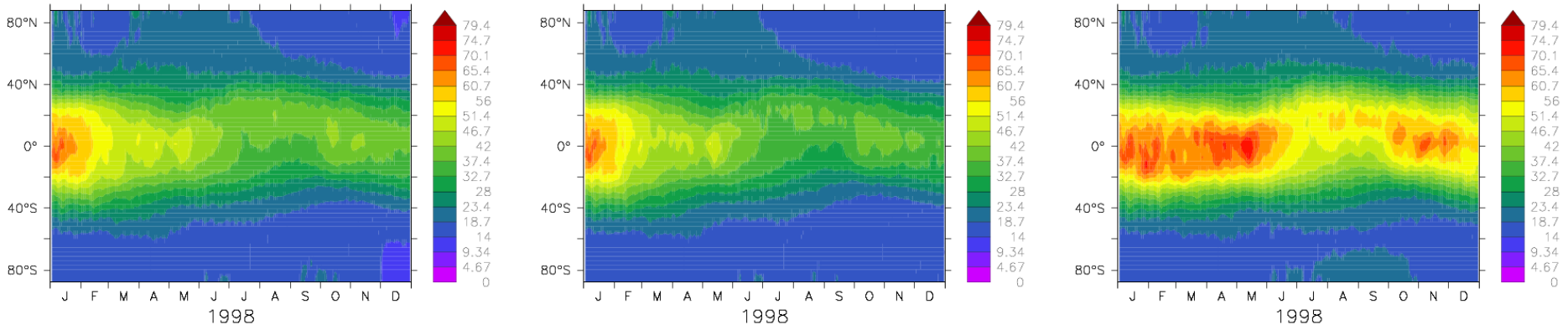
# 4 Species: CO

S-E4CHEM

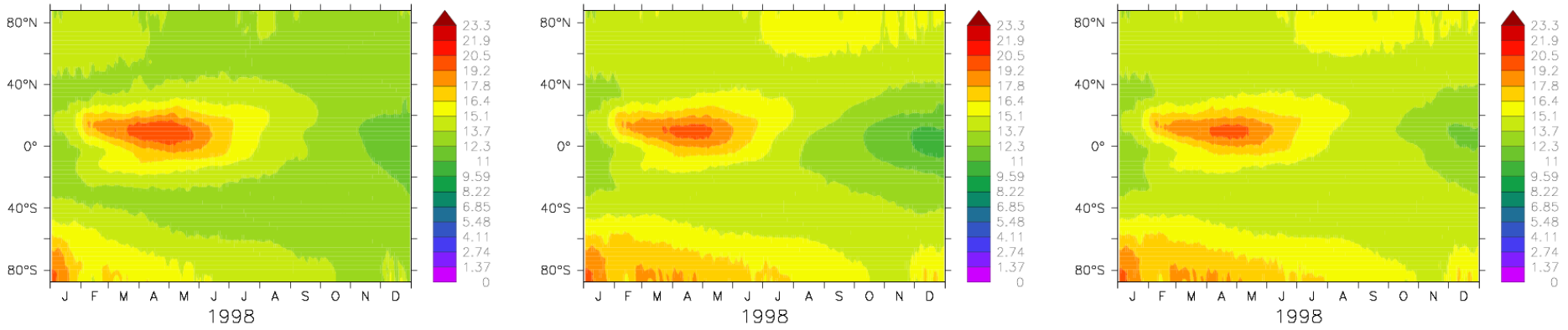
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean CO at 100 hPa, [ppbv]




zonal mean CO at 50 hPa, [ppbv]

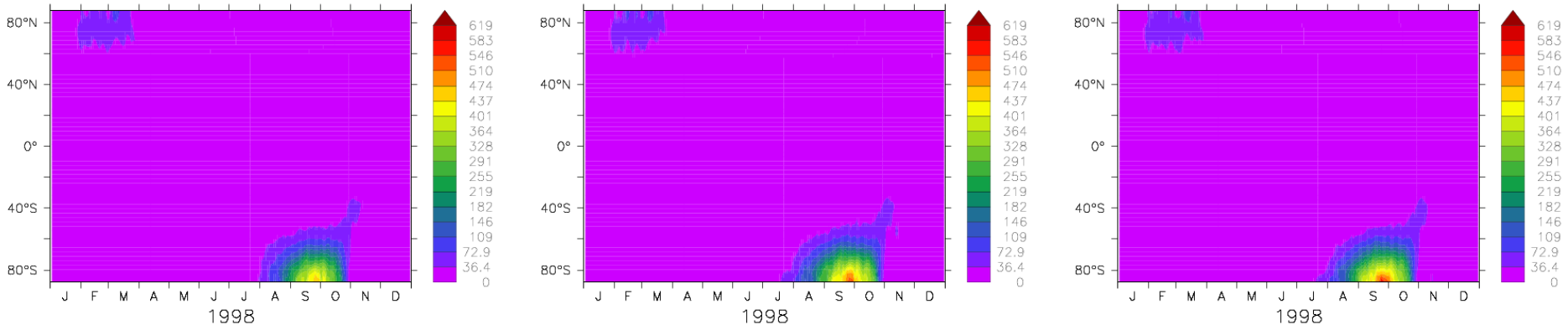


S-E4CHEM

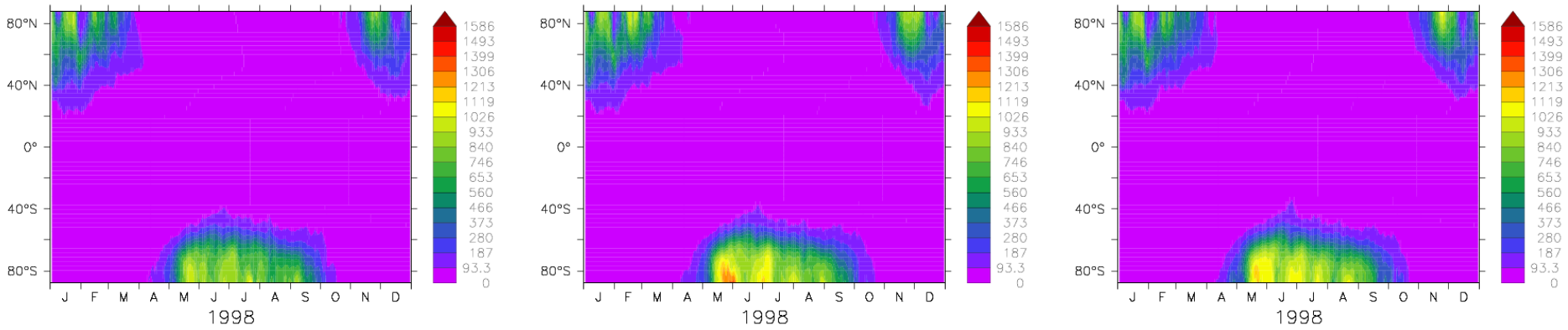
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean CO at 10 hPa, [ppbv]




zonal mean CO at 1 hPa, [ppbv]

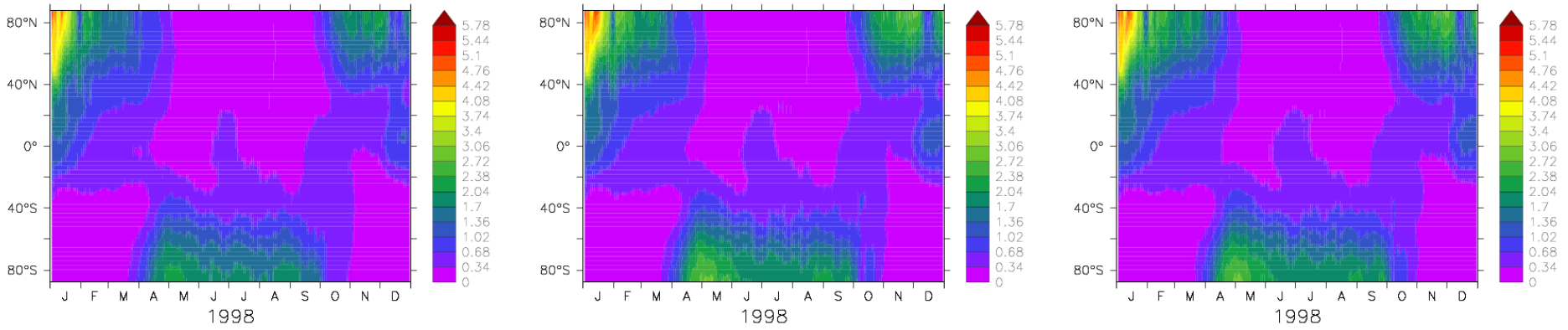


S-E4CHEM

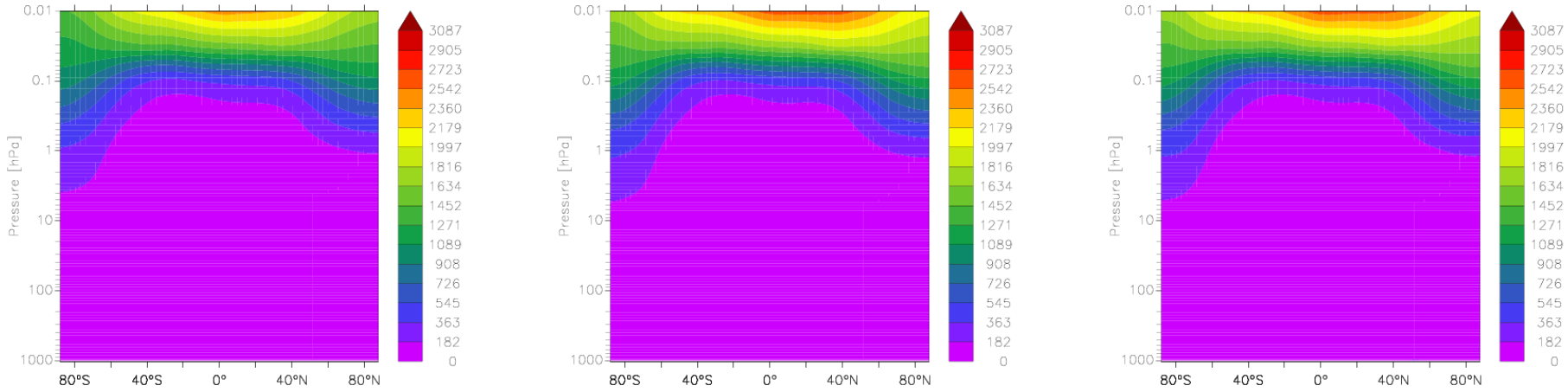
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean CO at 0.1 hPa, [ppmv]




zonal mean CO at t=1-Jan-1998:31-Dec-1998, [ppbv]

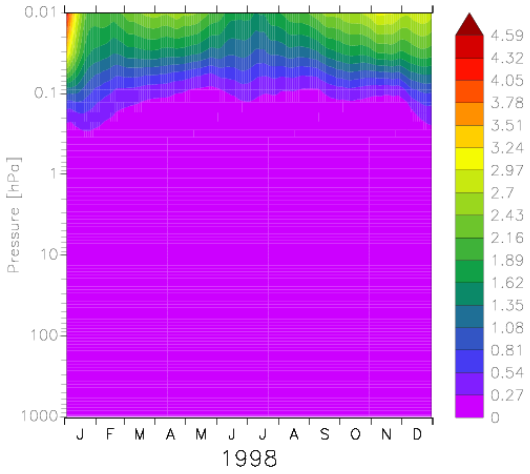


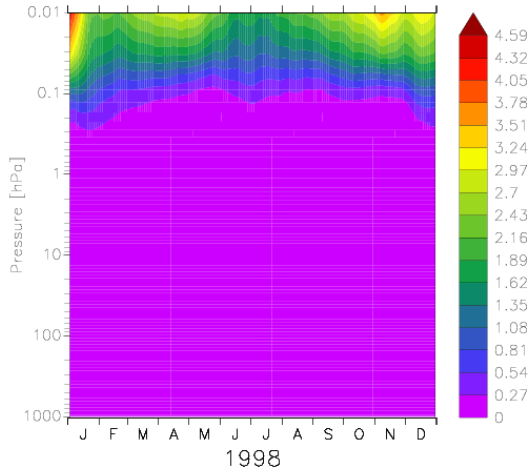
S-E4CHEM

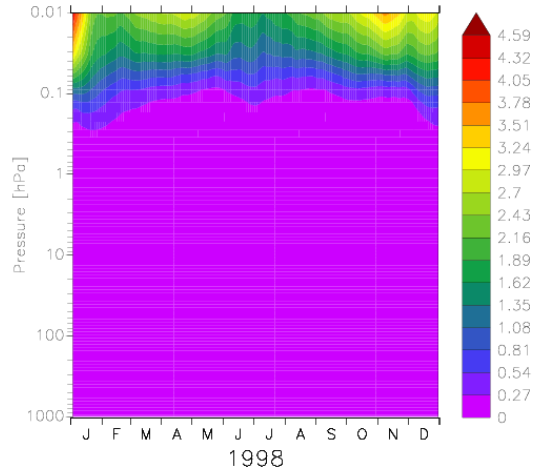
S-MECCA(E4CHEM)

S-MECCA(EVAL)

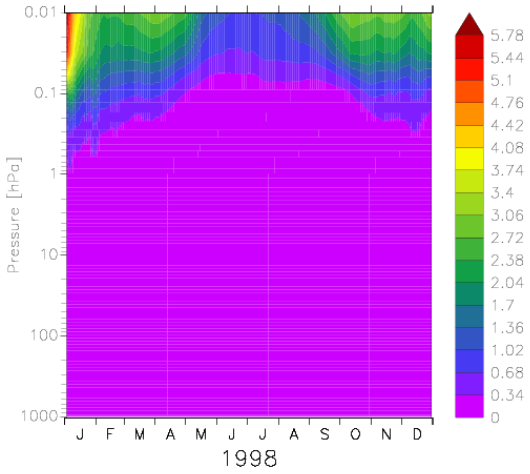
zonal mean CO at 20S-20N, [ppmv]

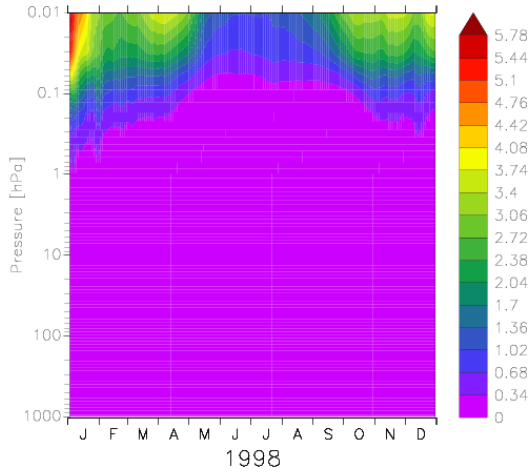


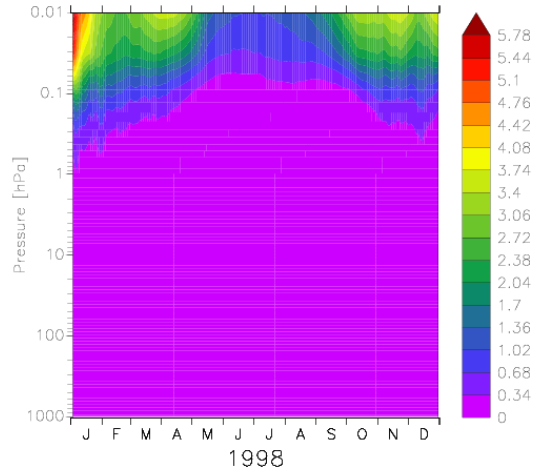




zonal mean CO at 30N-50N, [ppmv]



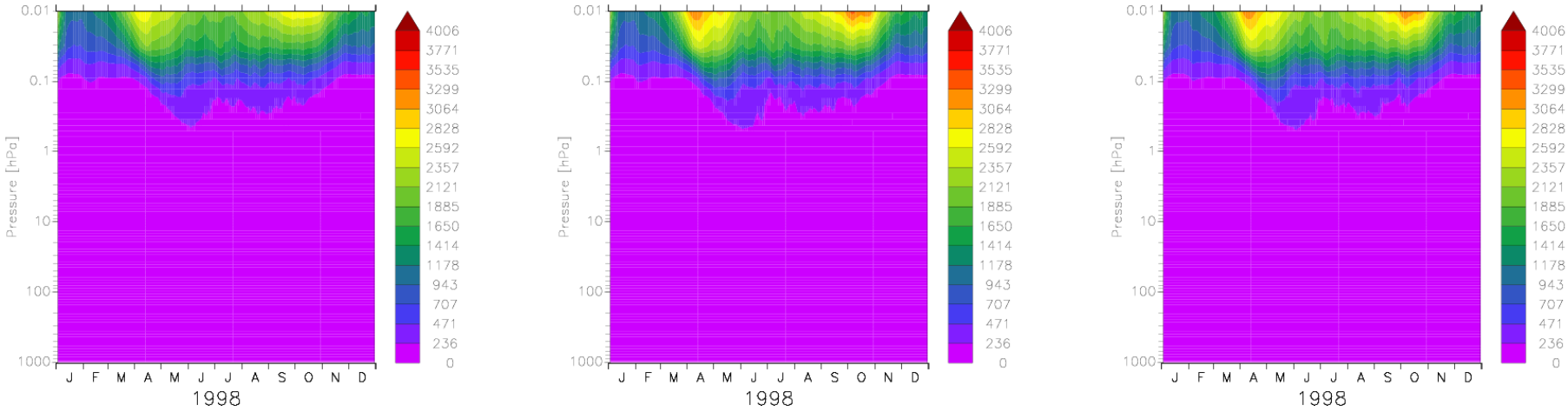



S-E4CHEM

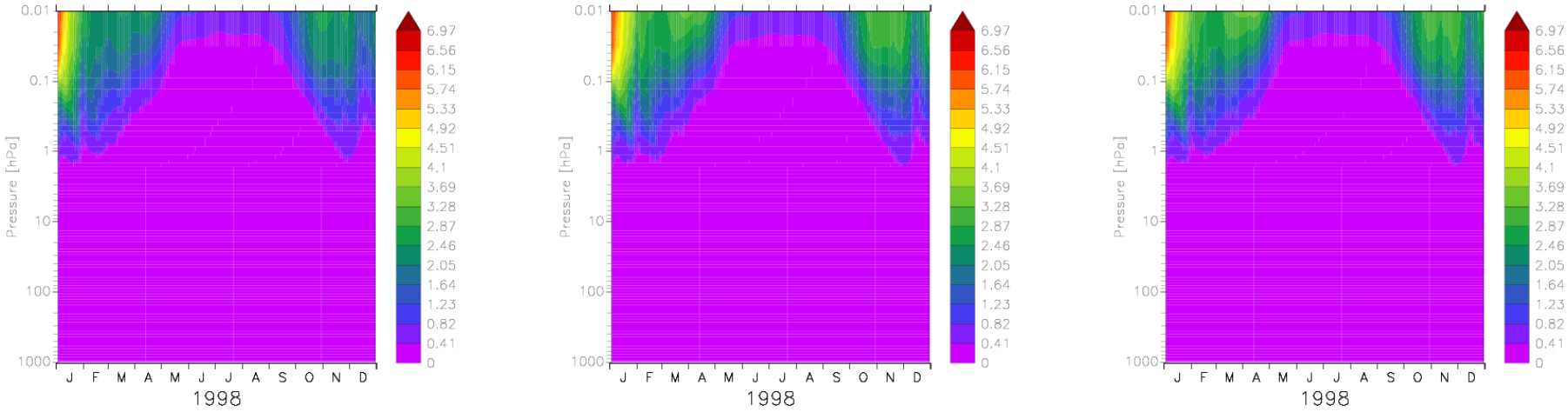
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean CO at 30S-50S, [ppbv]




zonal mean CO at 60N-90N, [ppmv]

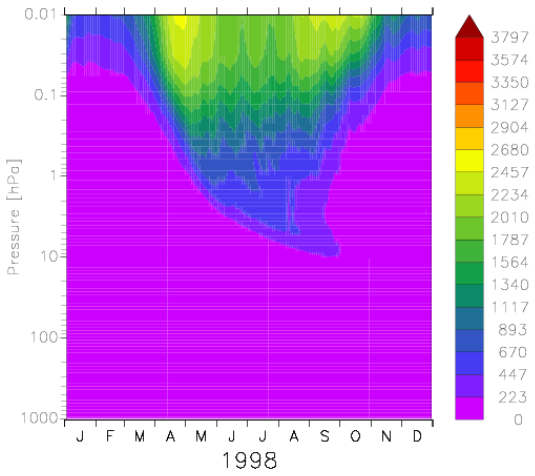


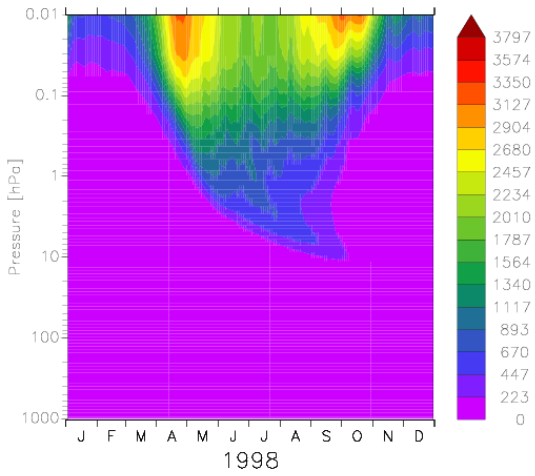
S-E4CHEM

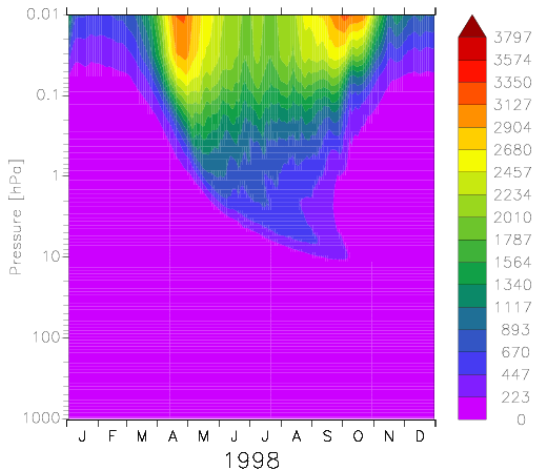
S-MECCA(E4CHEM)

S-MECCA(EVAL)

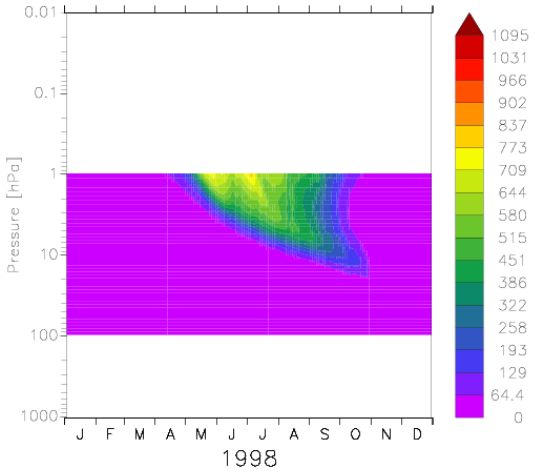
zonal mean CO at 60S-90S, [ppbv]

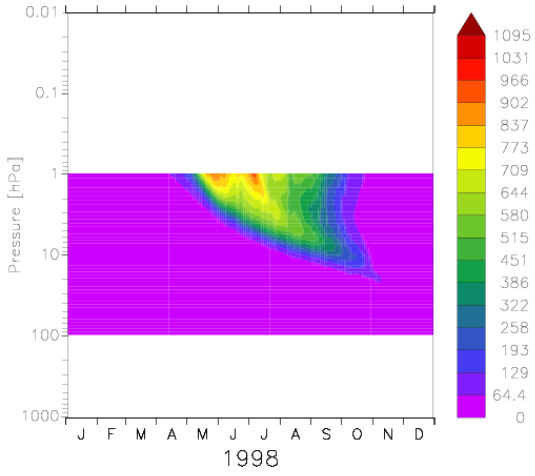


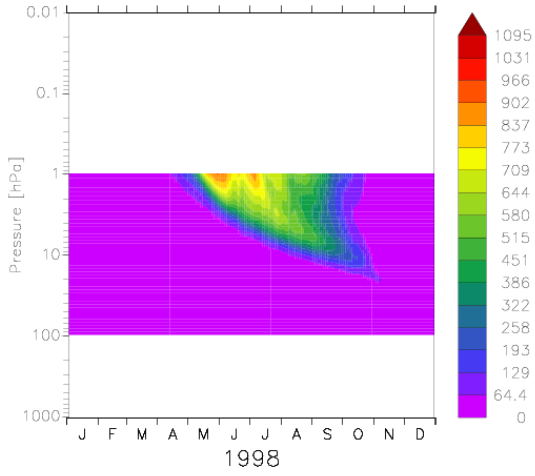




zonal mean CO at 60S-90S, [ppbv]



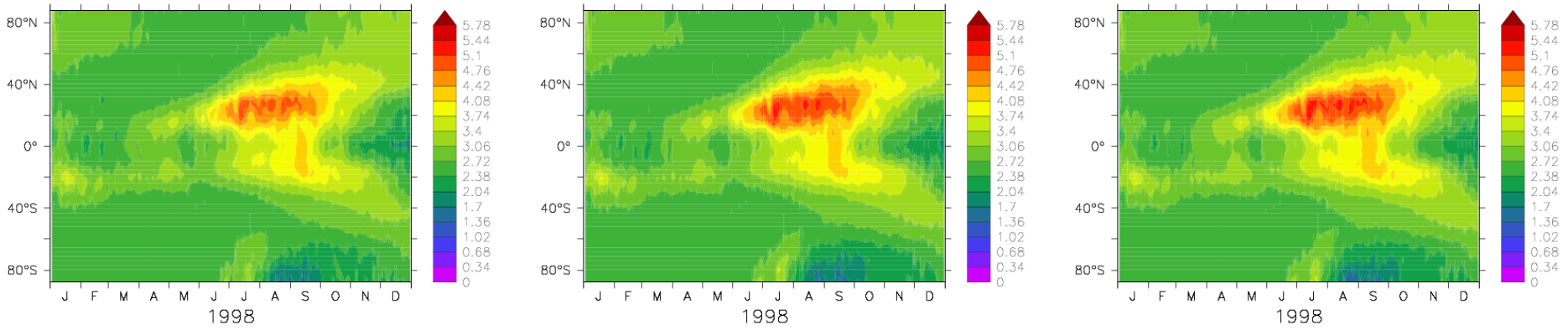
# 5 Species: $H_2O$

S-E4CHEM

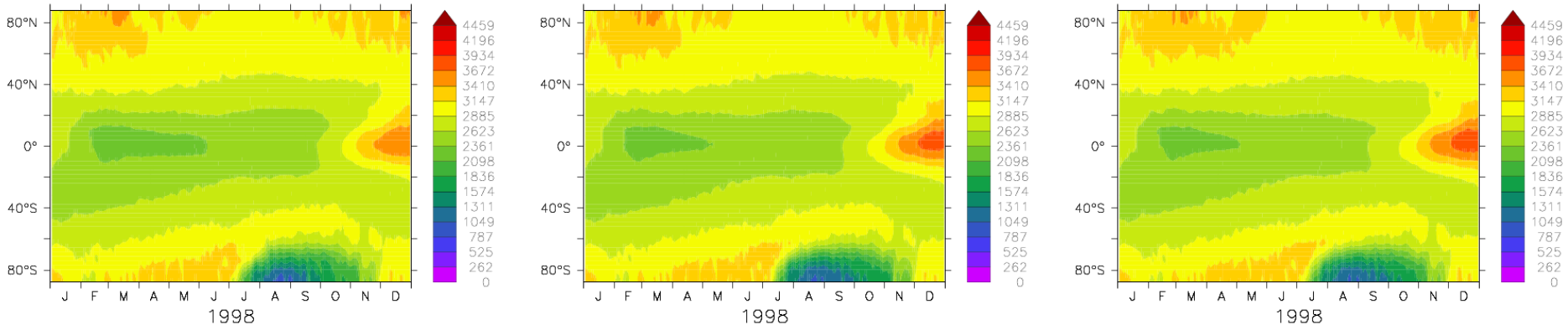
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean H2O at 100 hPa, [ppmv]




zonal mean H2O at 50 hPa, [ppbv]

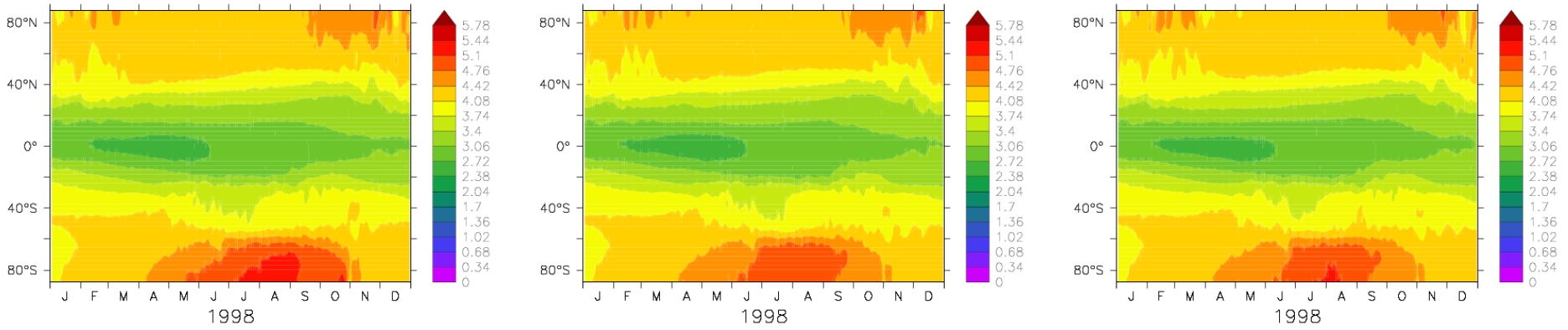


S-E4CHEM

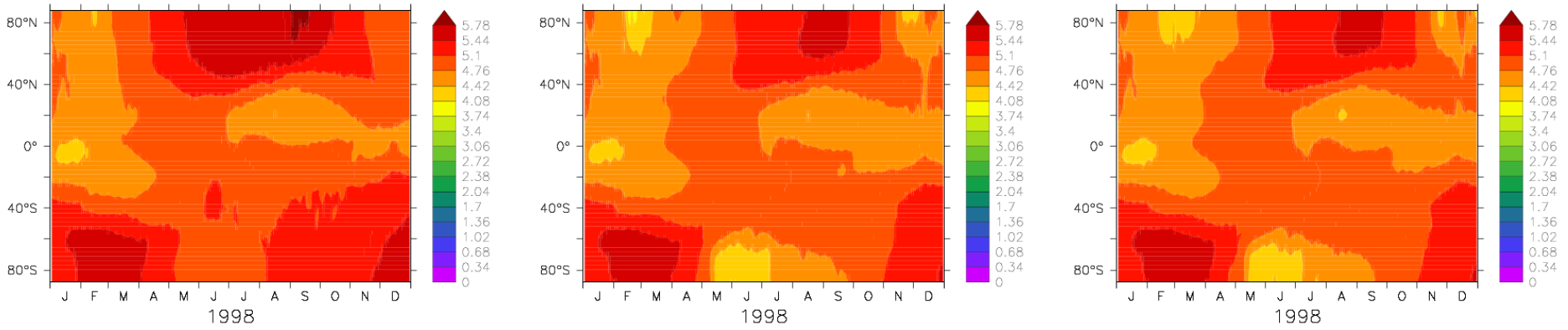
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean H2O at 10 hPa, [ppmv]




zonal mean H2O at 1 hPa, [ppmv]

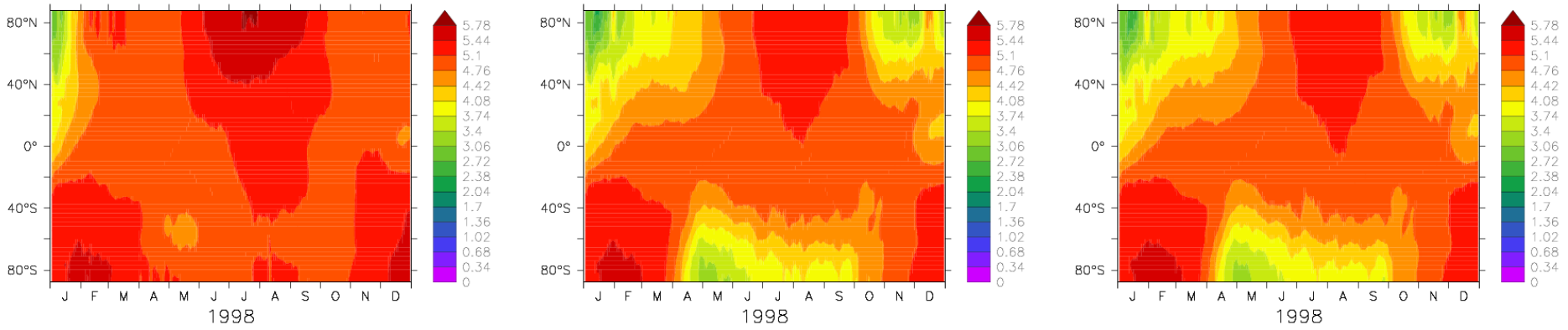


S-E4CHEM

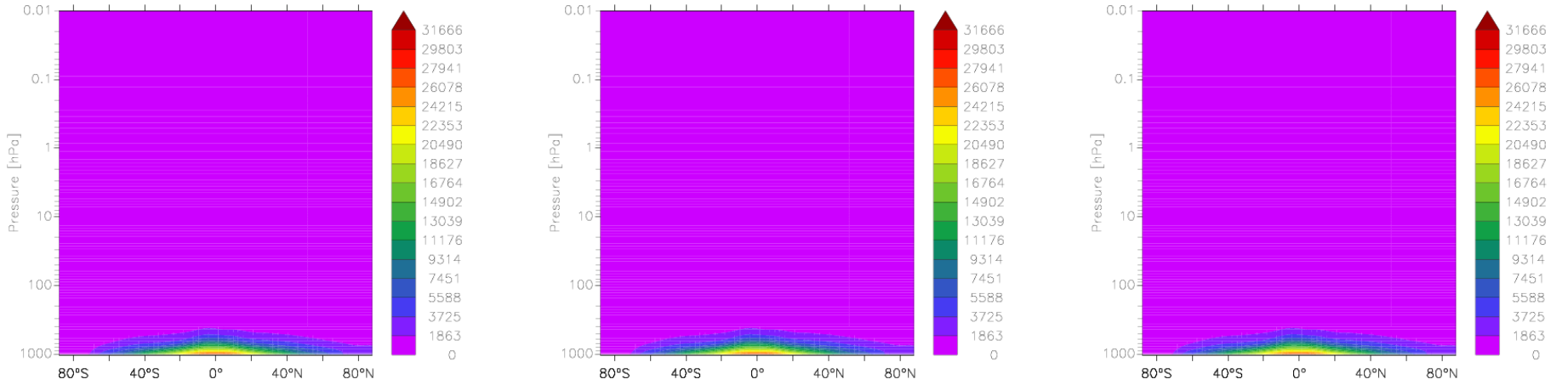
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean H2O at 0.1 hPa, [ppmv]




zonal mean H2O at t=1-Jan-1998:31-Dec-1998, [ppmv]

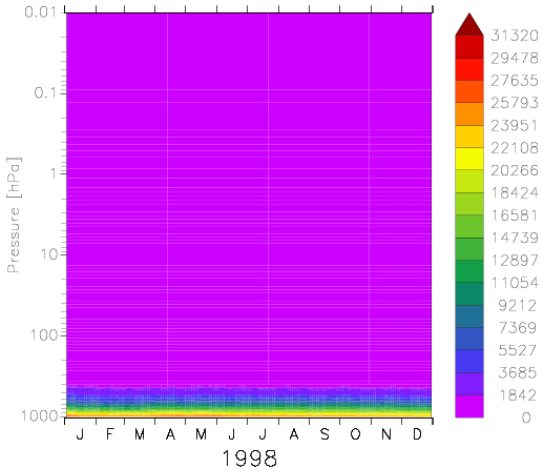


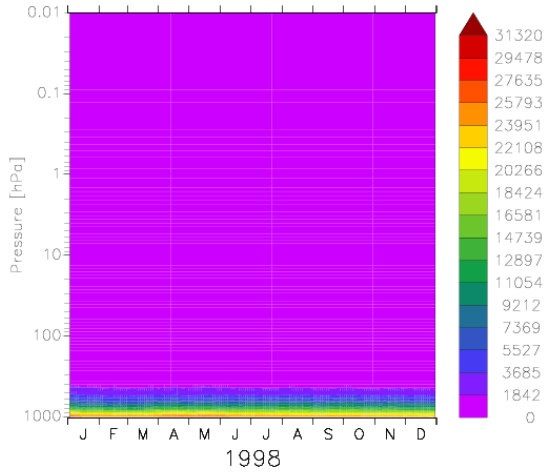
S-E4CHEM

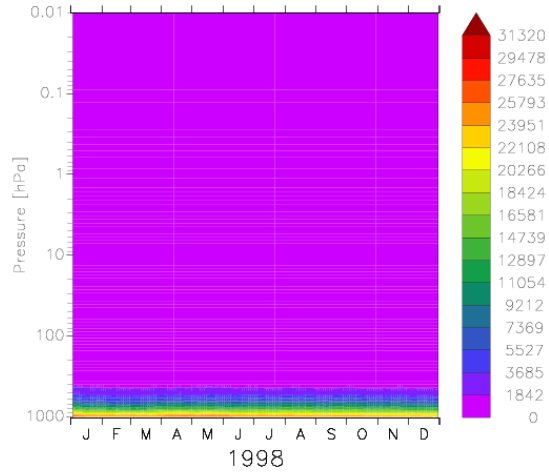
S-MECCA(E4CHEM)

S-MECCA(EVAL)

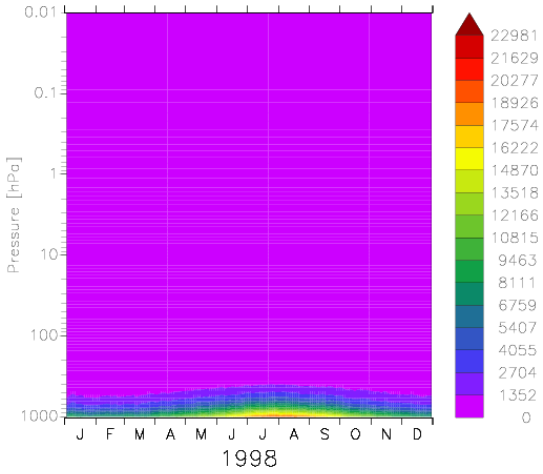
zonal mean H2O at 20S-20N, [ppmv]

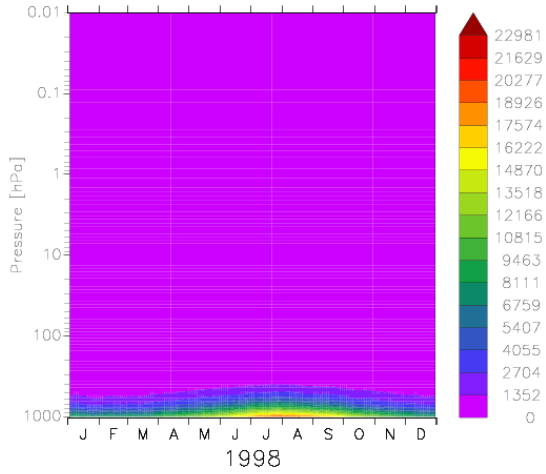


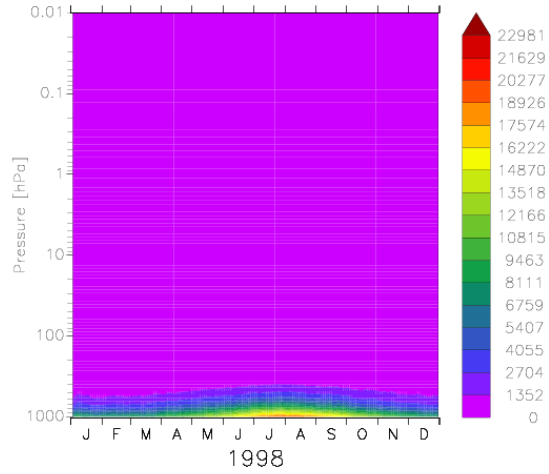




zonal mean H2O at 30N-50N, [ppmv]



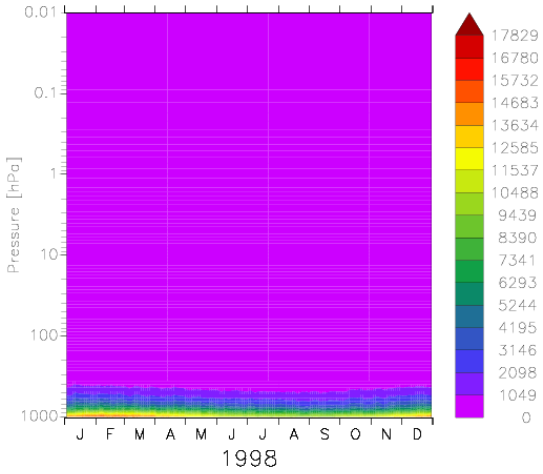



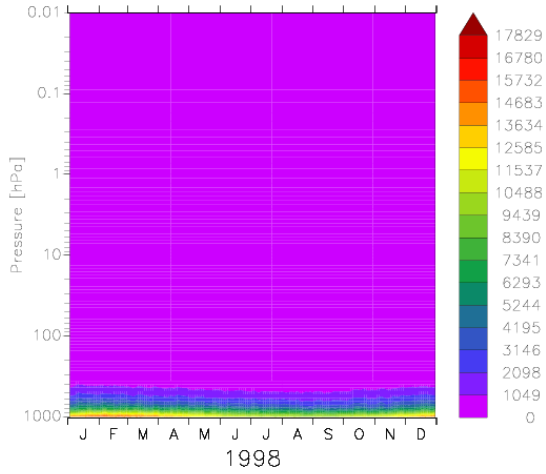
S-E4CHEM

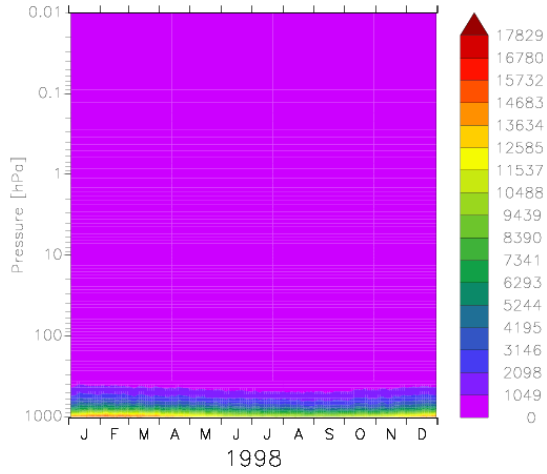
S-MECCA(E4CHEM)

S-MECCA(EVAL)

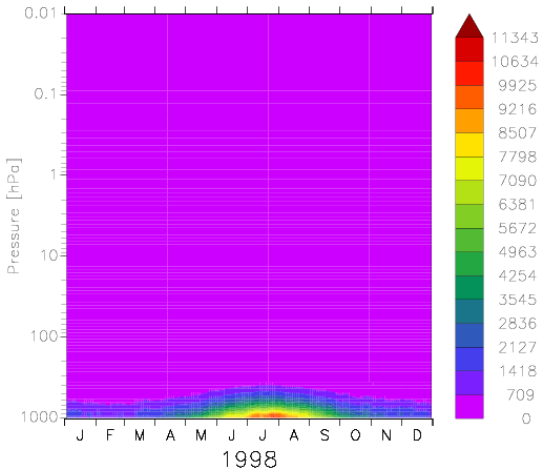
zonal mean H2O at 30S-50S, [ppmv]

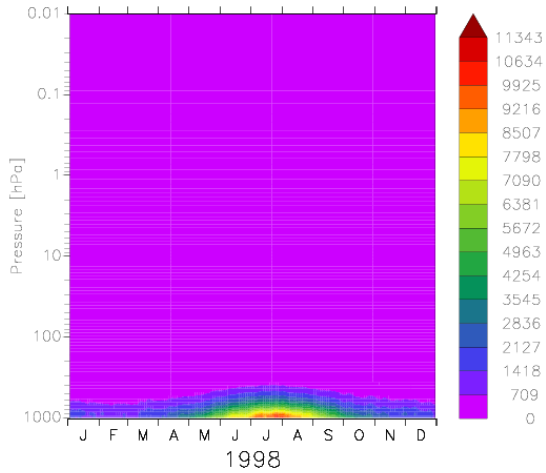


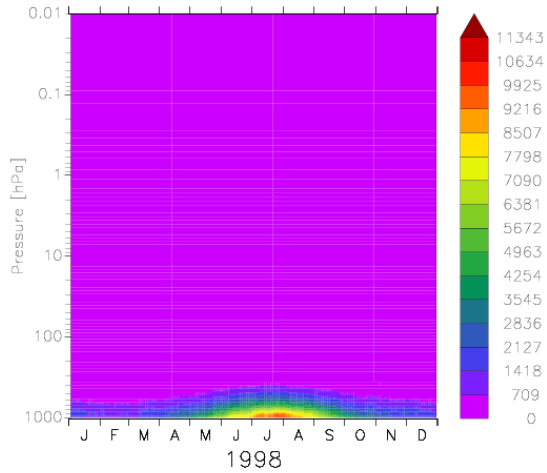




zonal mean H2O at 60N-90N, [ppmv]



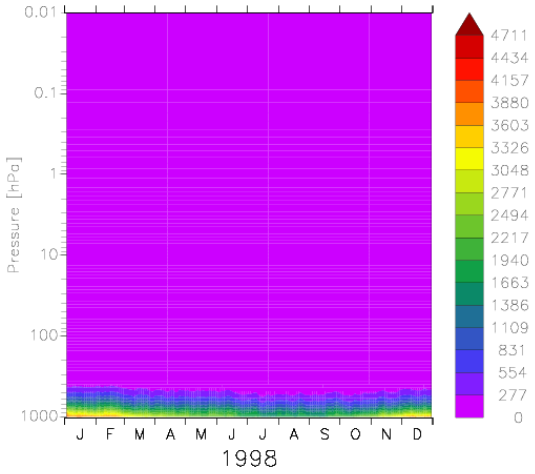



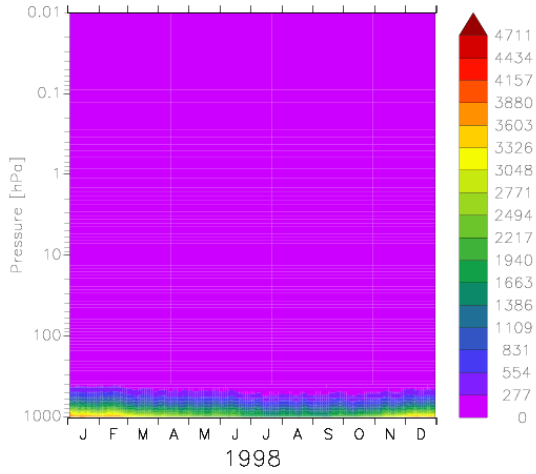
S-E4CHEM

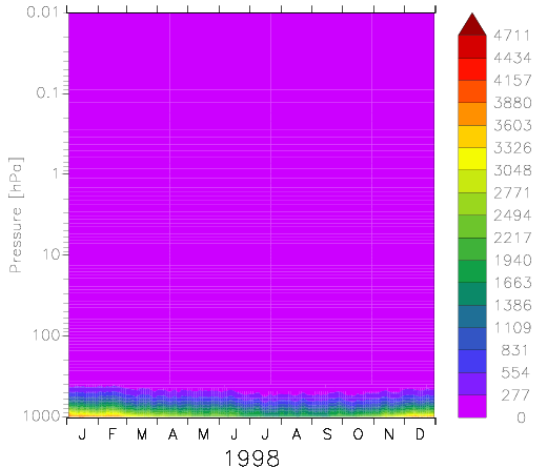
S-MECCA(E4CHEM)

S-MECCA(EVAL)

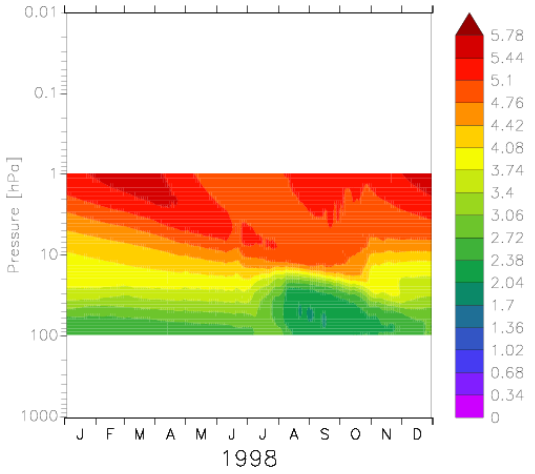
zonal mean H2O at 60S-90S, [ppmv]

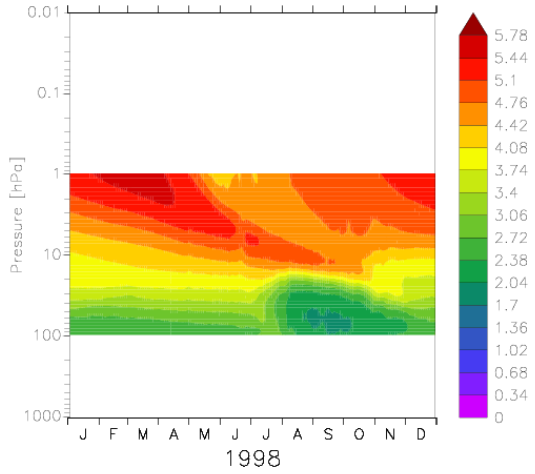


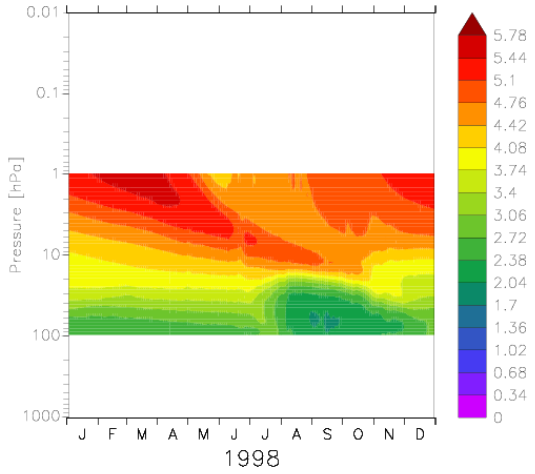




zonal mean H2O at 60S-90S, [ppmv]



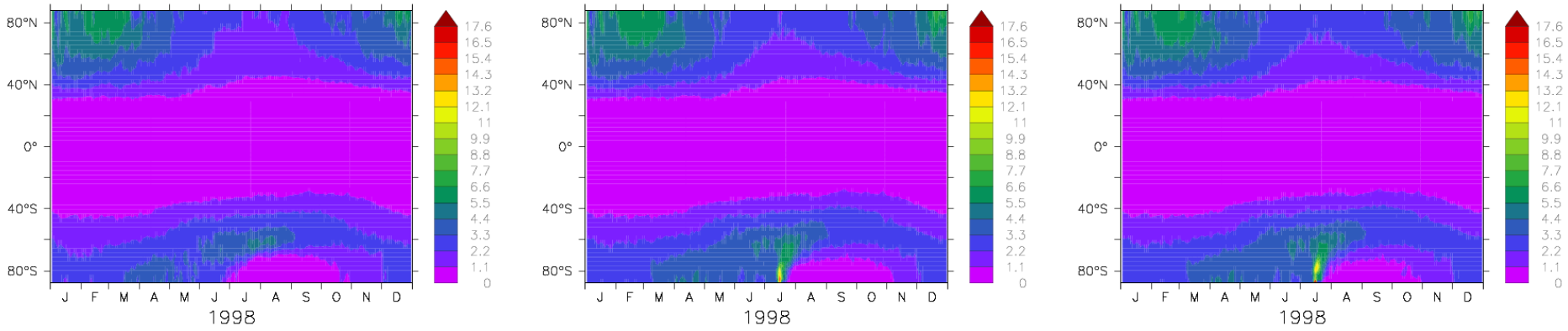
# 6 Species: $HNO_3$

S-E4CHEM

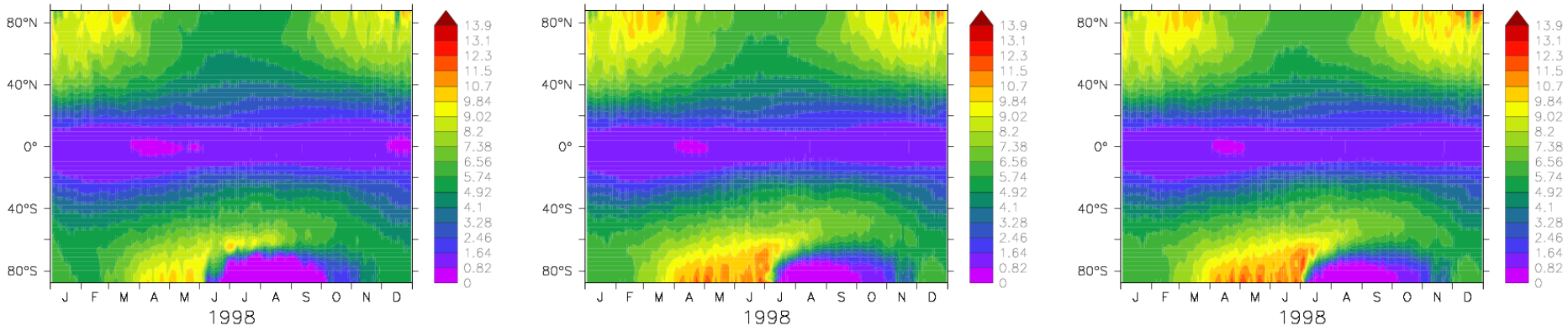
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean HNO3 at 100 hPa, [ppbv]




zonal mean HNO3 at 50 hPa, [ppbv]

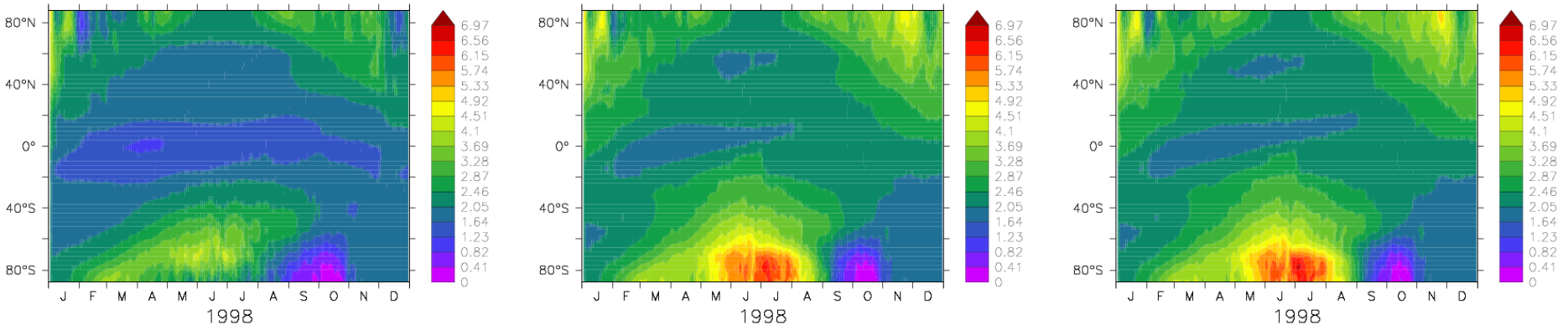


S-E4CHEM

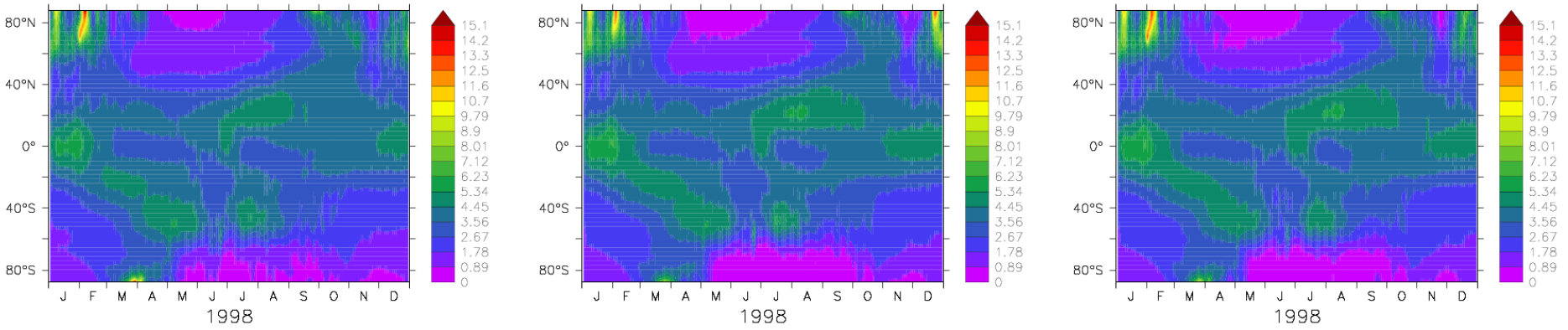
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean HNO3 at 10 hPa, [ppbv]




zonal mean HNO3 at 1 hPa, [pptv]

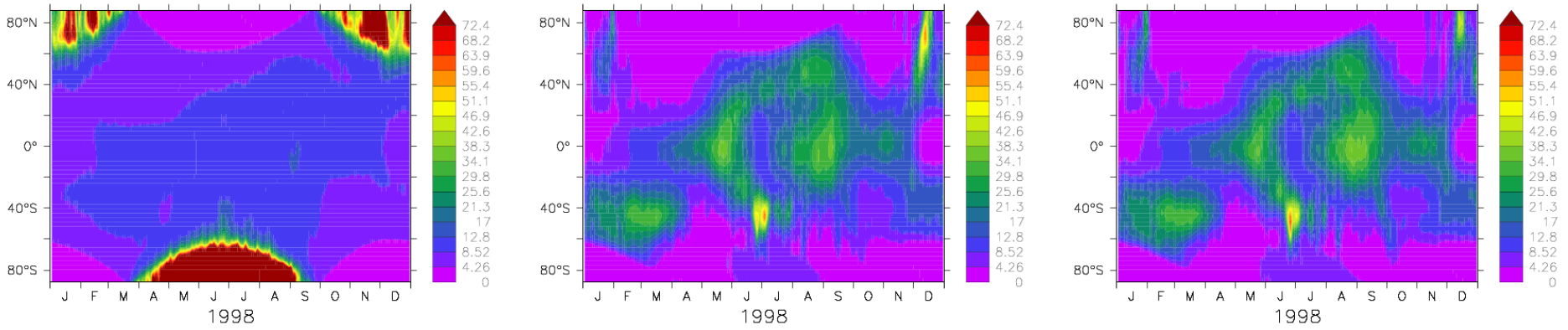


S-E4CHEM

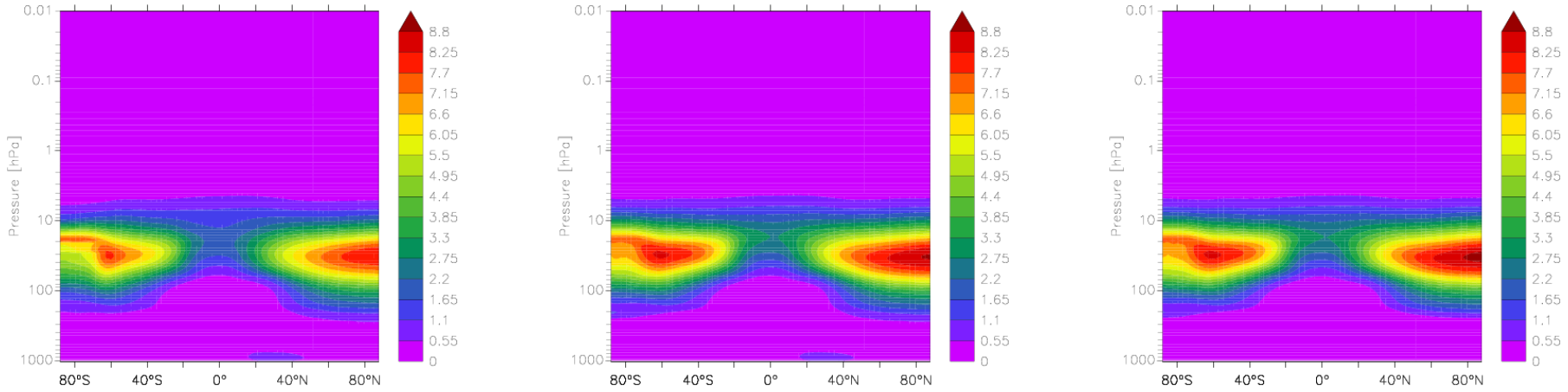
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean HNO3 at 0.1 hPa, [ppqv]




zonal mean HNO3 at t=1-Jan-1998:31-Dec-1998, [ppbv]

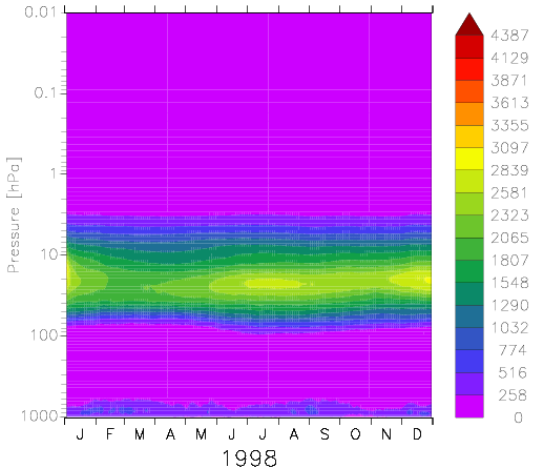


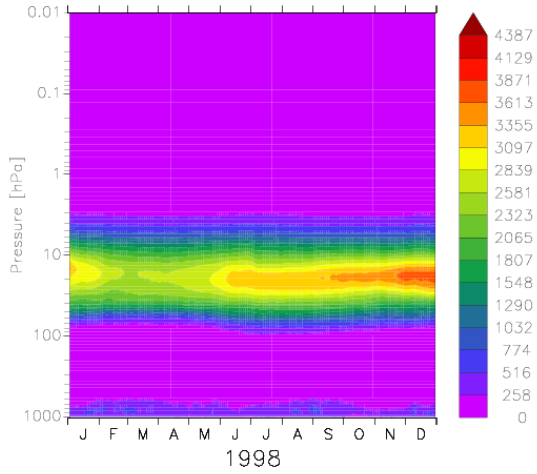
S-E4CHEM

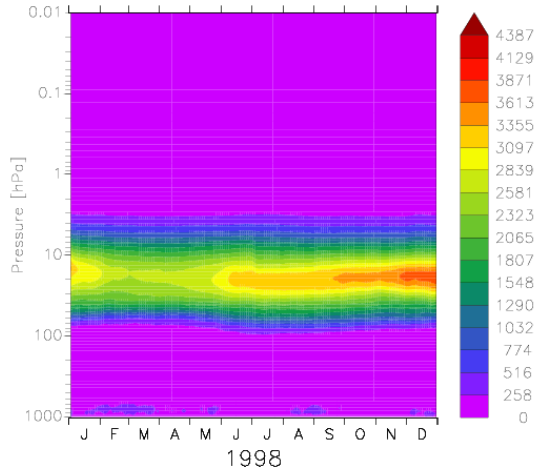
S-MECCA(E4CHEM)

S-MECCA(EVAL)

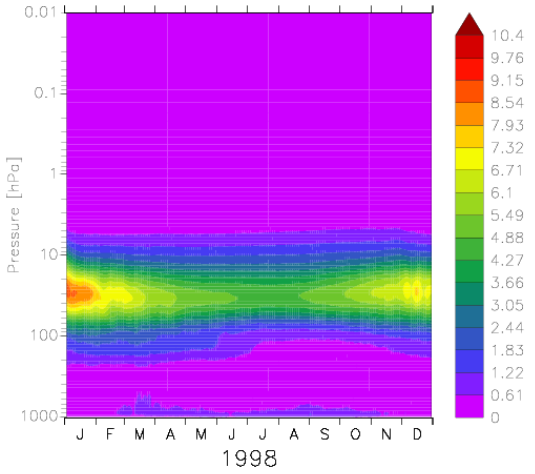
zonal mean HNO3 at 20S-20N, [pptv]

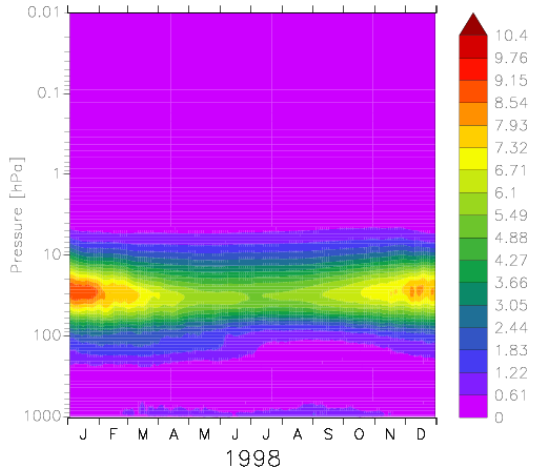


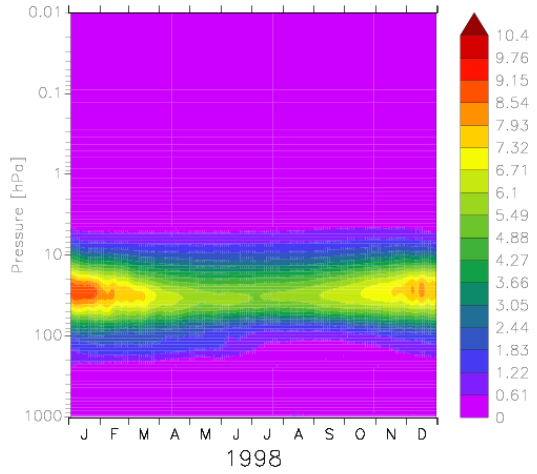




zonal mean HNO3 at 30N-50N, [ppbv]



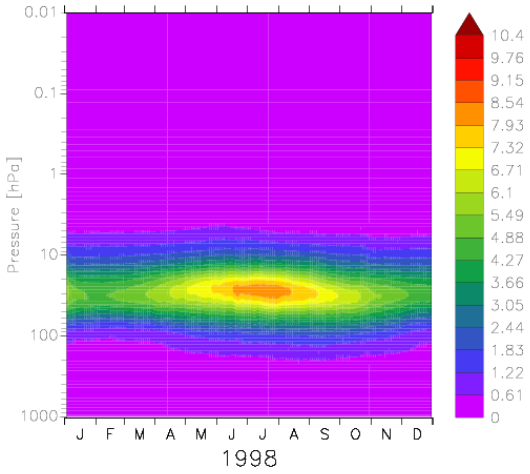



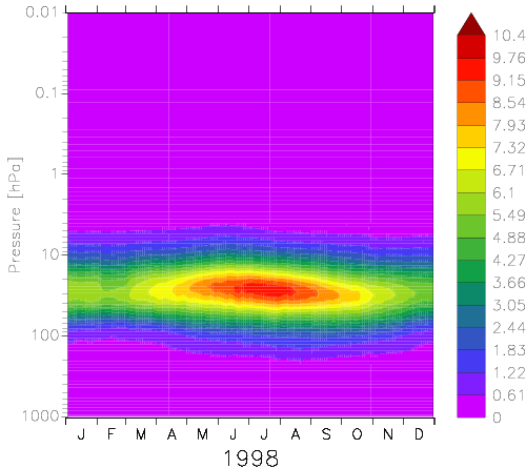
S-E4CHEM

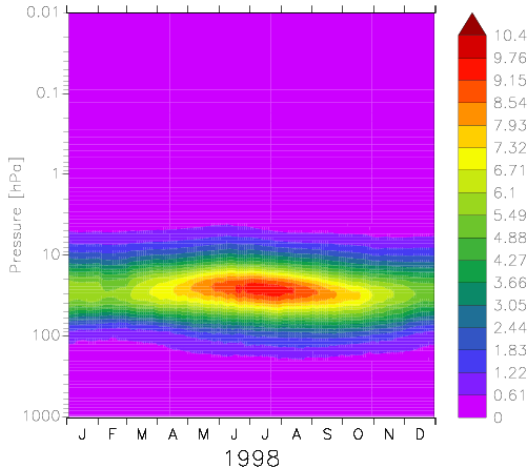
S-MECCA(E4CHEM)

S-MECCA(EVAL)

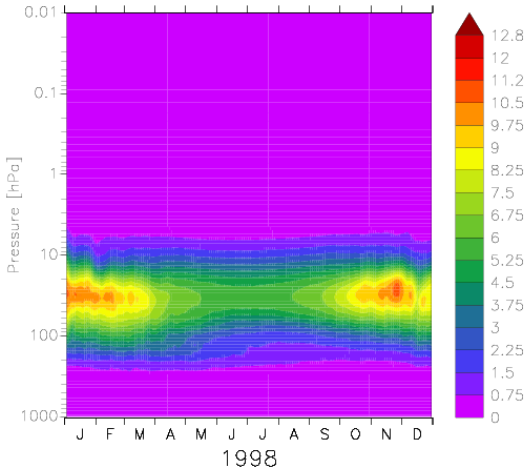
zonal mean HNO3 at 30S-50S, [ppbv]

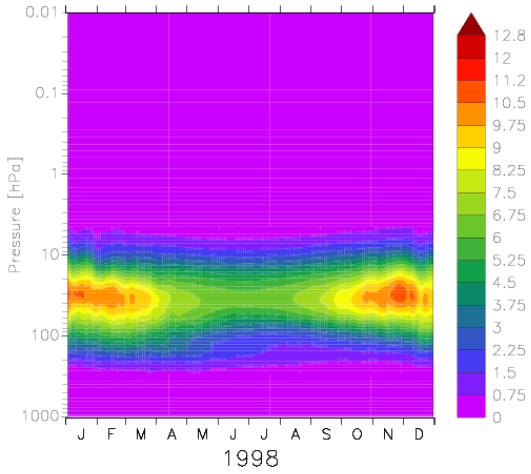


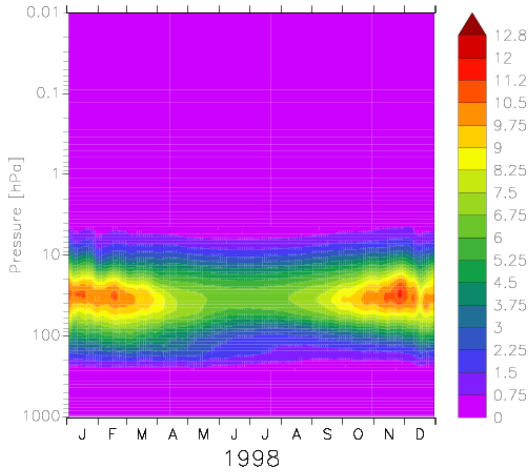




zonal mean HNO3 at 60N-90N, [ppbv]



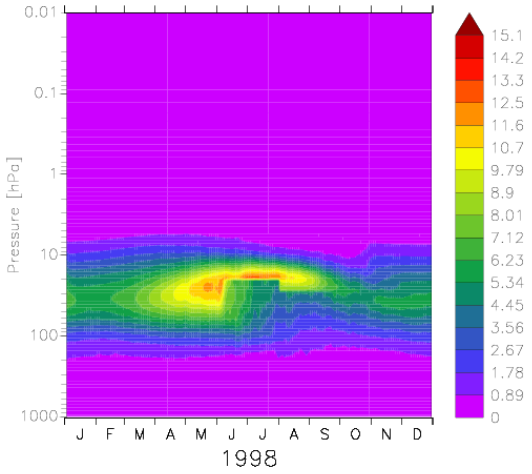



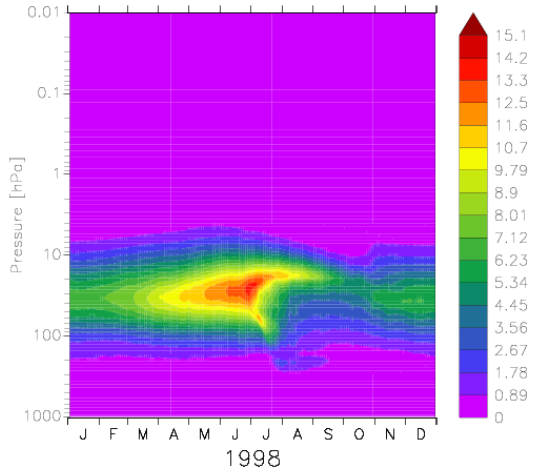
S-E4CHEM

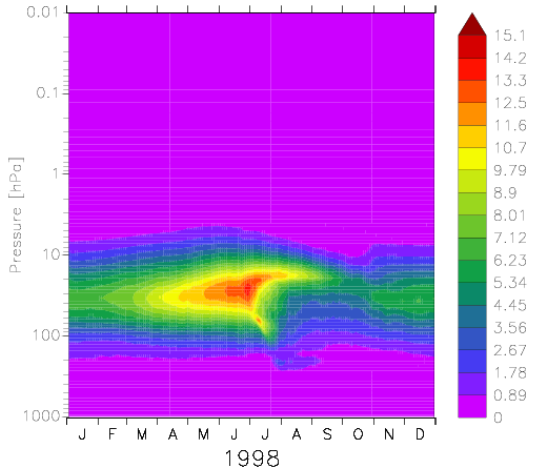
S-MECCA(E4CHEM)

S-MECCA(EVAL)

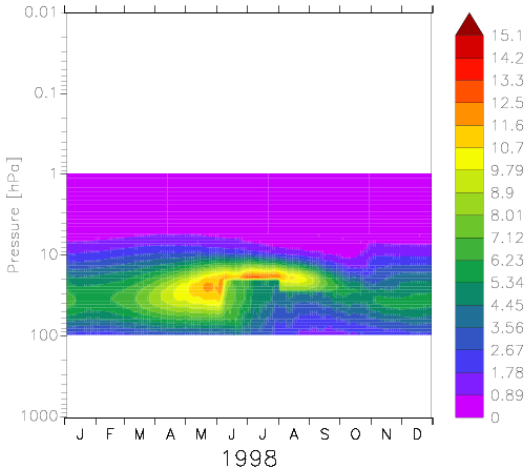
zonal mean HNO3 at 60S-90S, [ppbv]

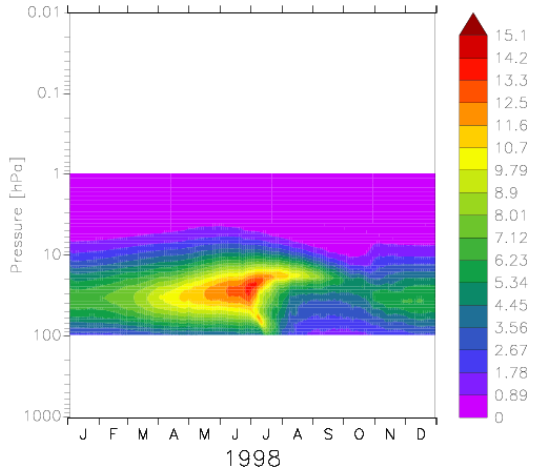


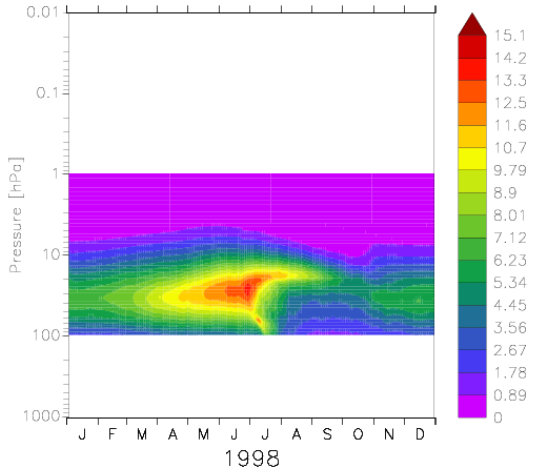




zonal mean HNO3 at 60S-90S, [ppbv]



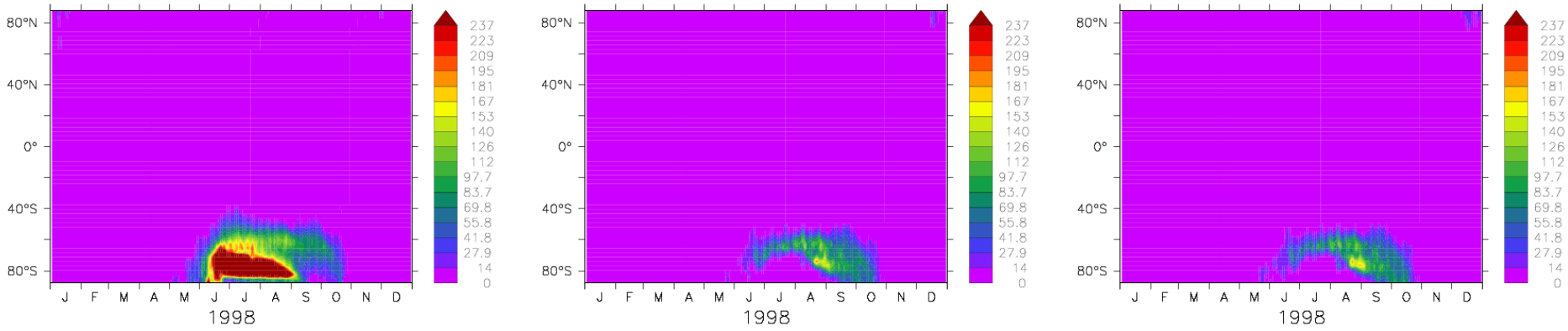



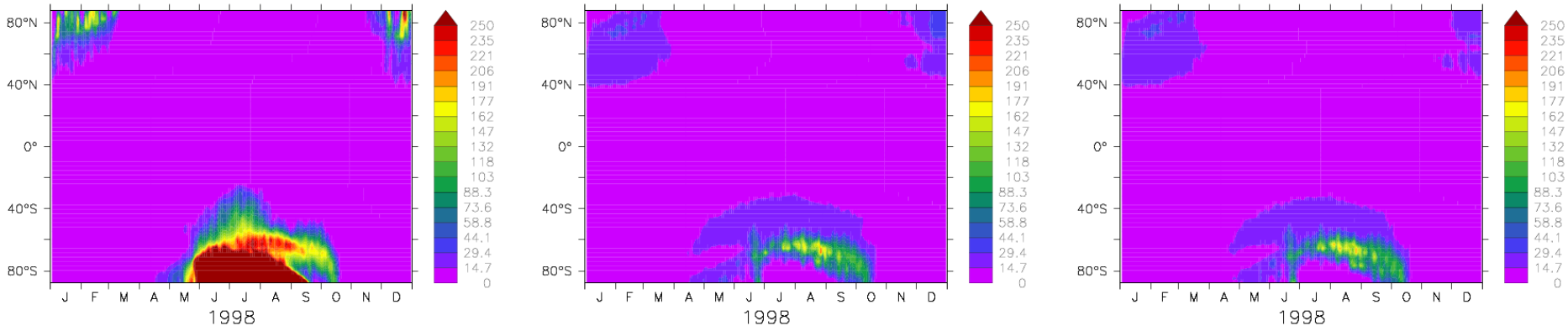
# 7 Species: HOCl

S-E4CHEM | S-MECCA(E4CHEM) | S-MECCA(EVAL)

zonal mean HOCl at 100 hPa, [pptv]




zonal mean HOCl at 50 hPa, [pptv]

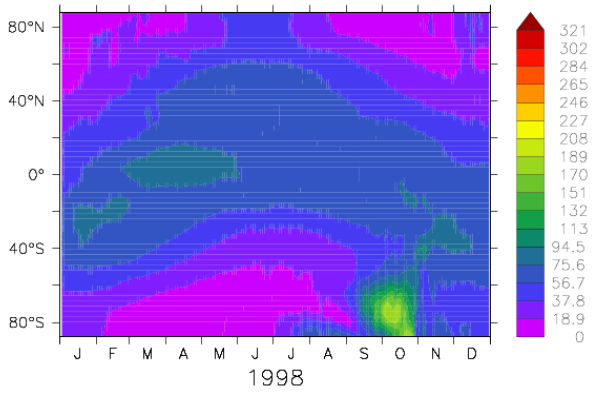


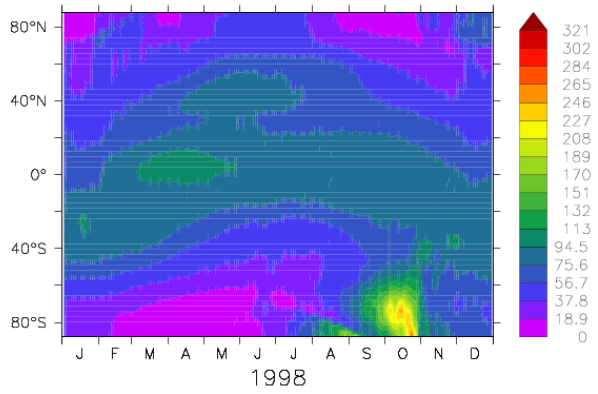
S-E4CHEM

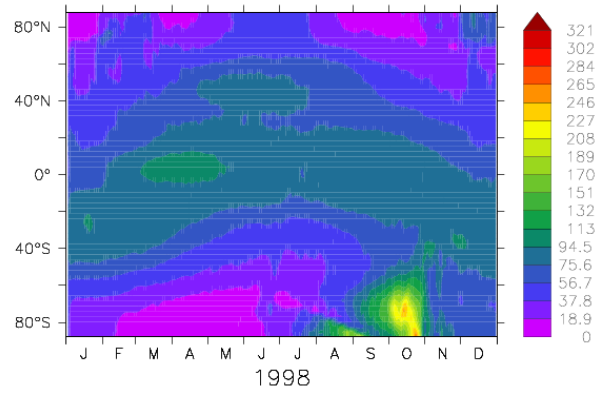
S-MECCA(E4CHEM)

S-MECCA(EVAL)

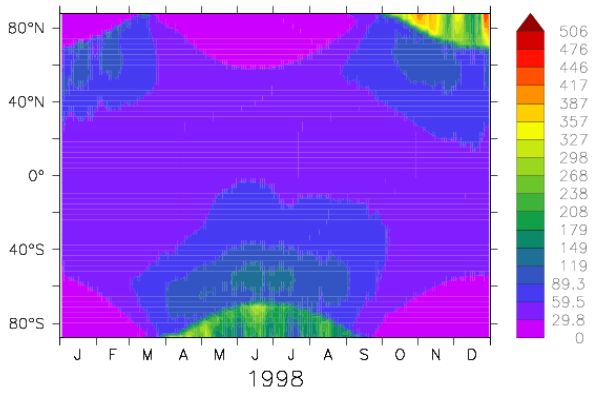
zonal mean HOCl at 10 hPa, [pptv]

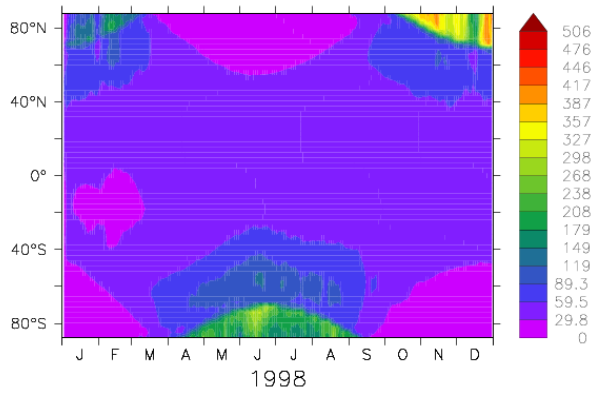


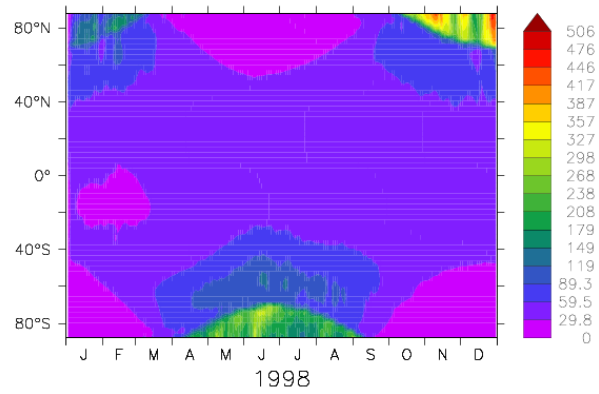




zonal mean HOCl at 1 hPa, [pptv]



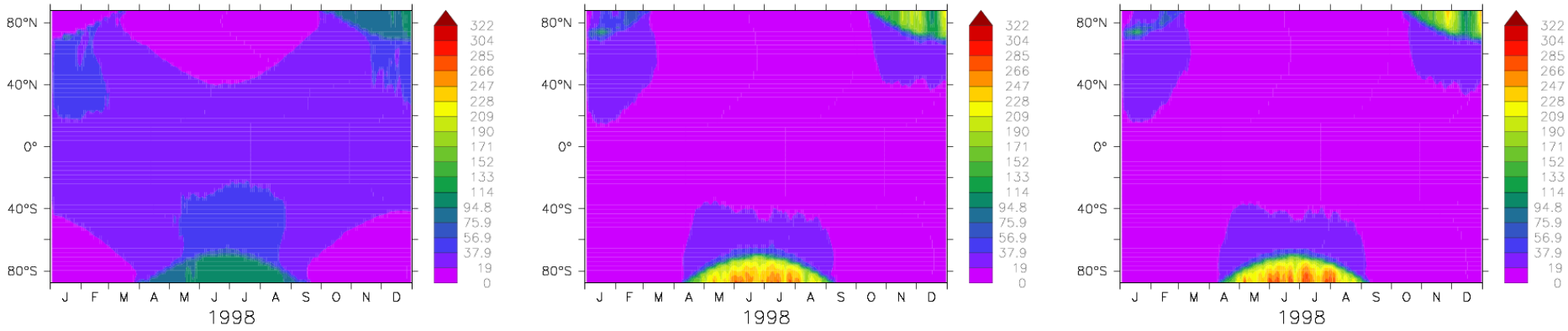



S-E4CHEM

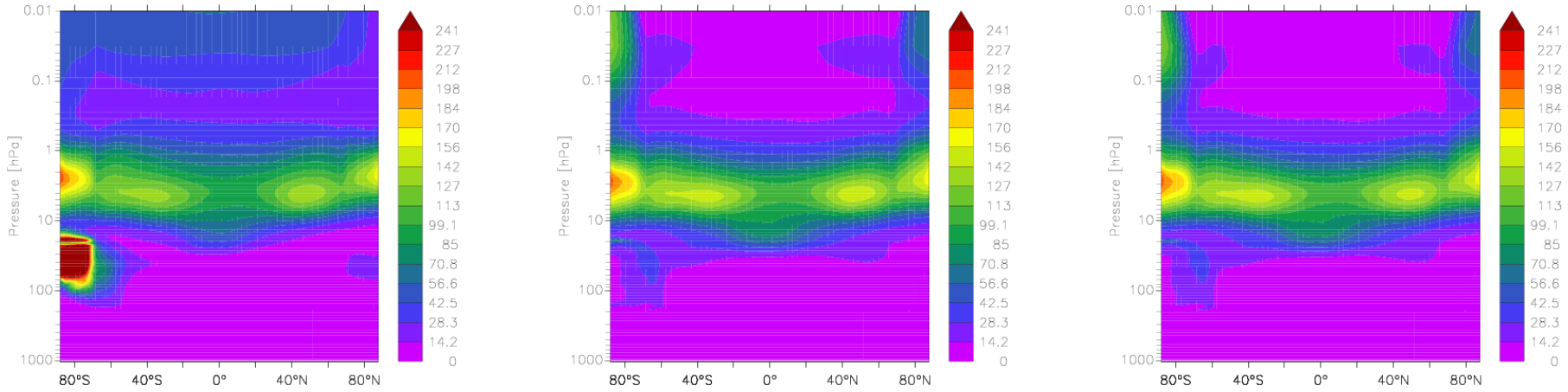
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean HOCl at 0.1 hPa, [pptv]




zonal mean HOCl at t=1-Jan-1998:31-Dec-1998, [pptv]

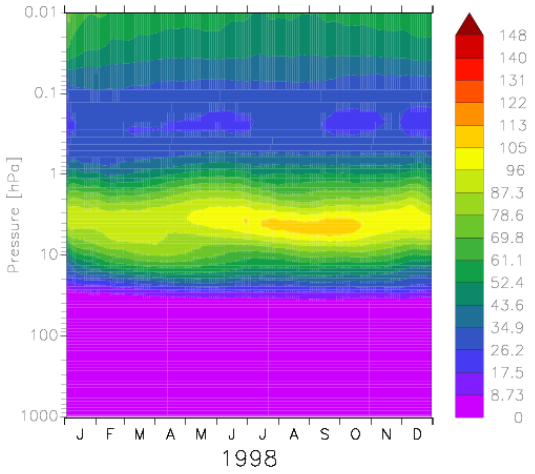


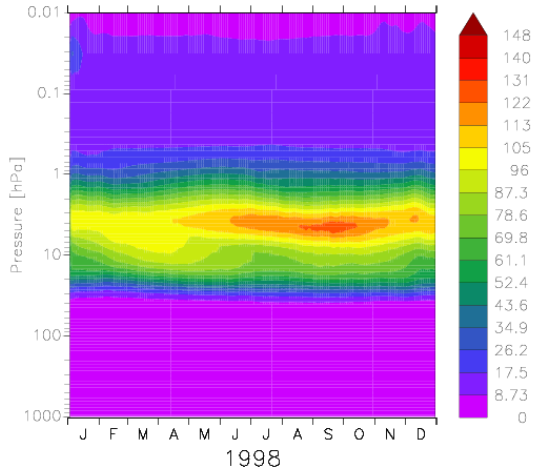
S-E4CHEM

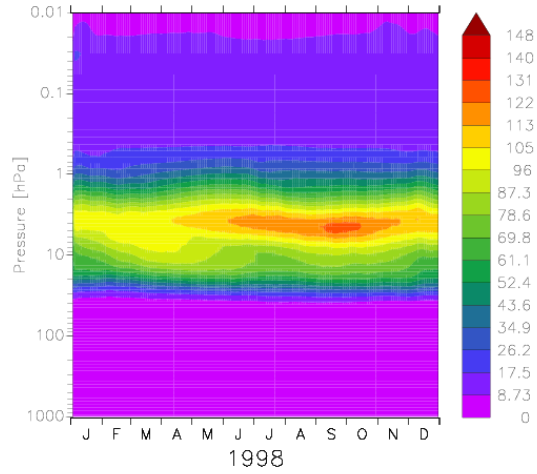
S-MECCA(E4CHEM)

S-MECCA(EVAL)

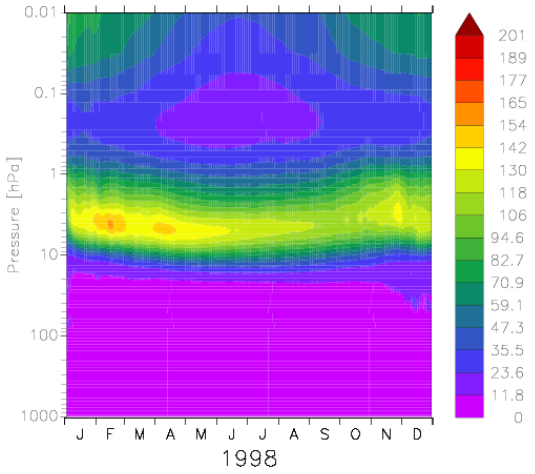
zonal mean HOCl at 20S-20N, [pptv]

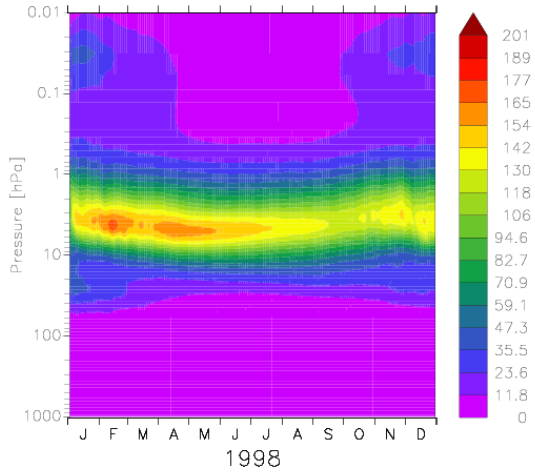


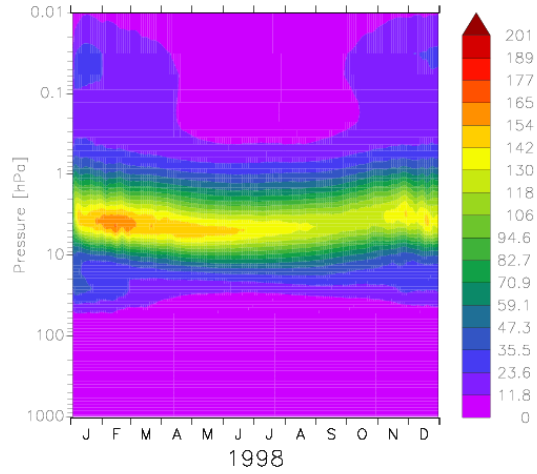




zonal mean HOCl at 30N-50N, [pptv]



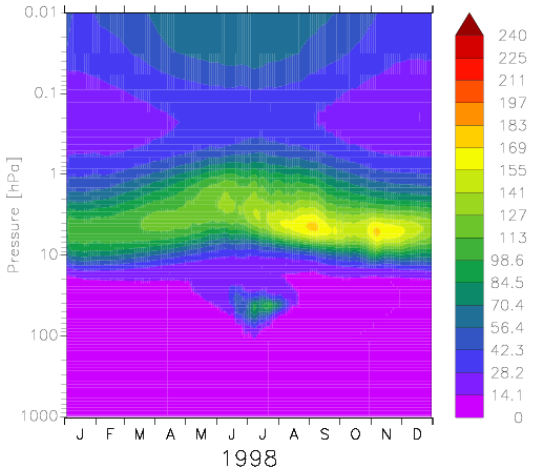



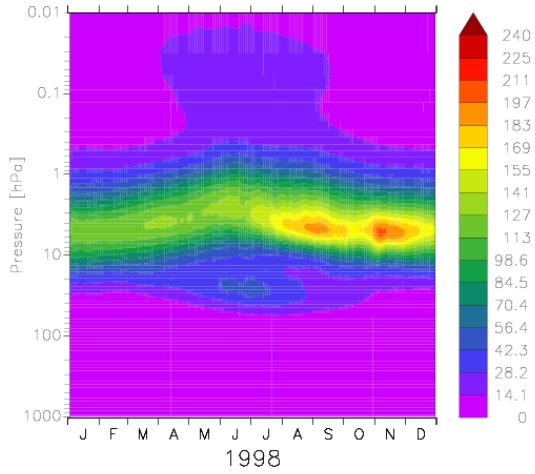
S-E4CHEM

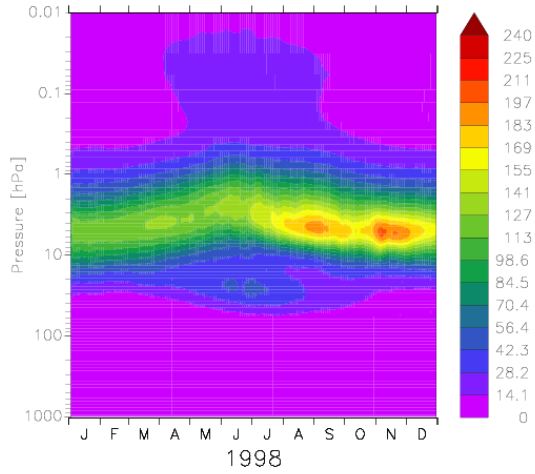
S-MECCA(E4CHEM)

S-MECCA(EVAL)

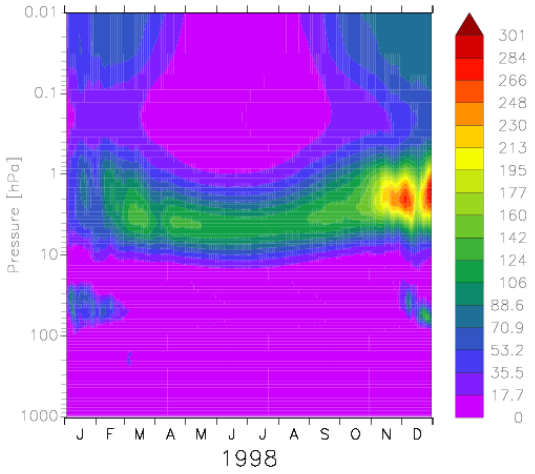
zonal mean HOCl at 30S-50S, [pptv]

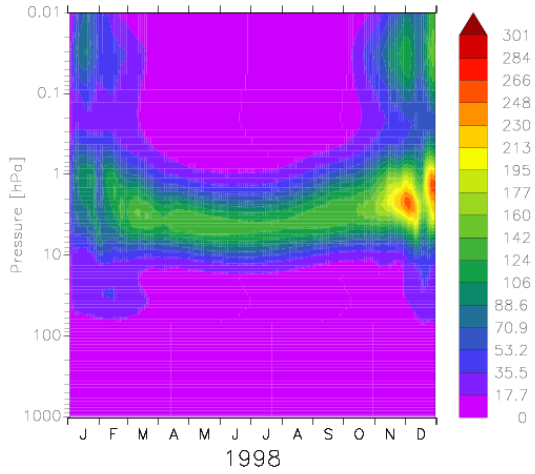


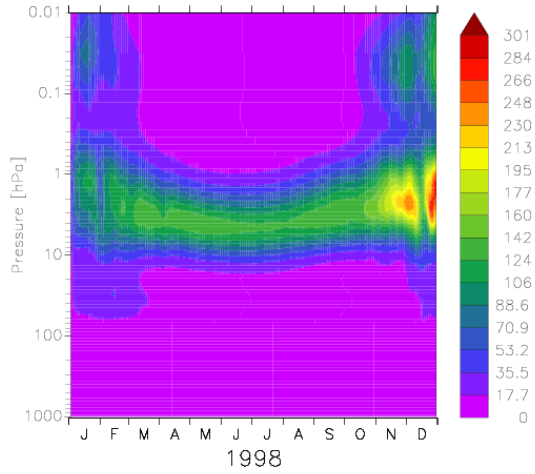




zonal mean HOCl at 60N-90N, [pptv]



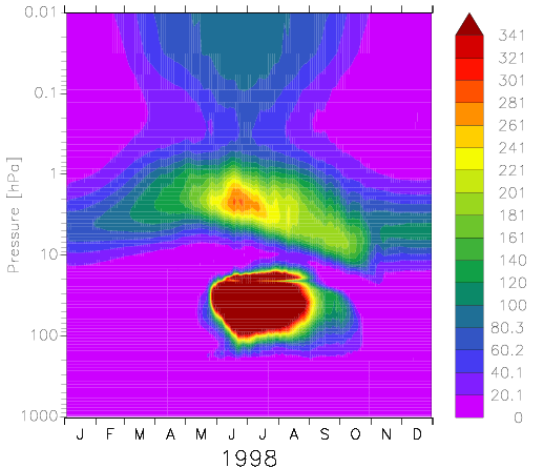



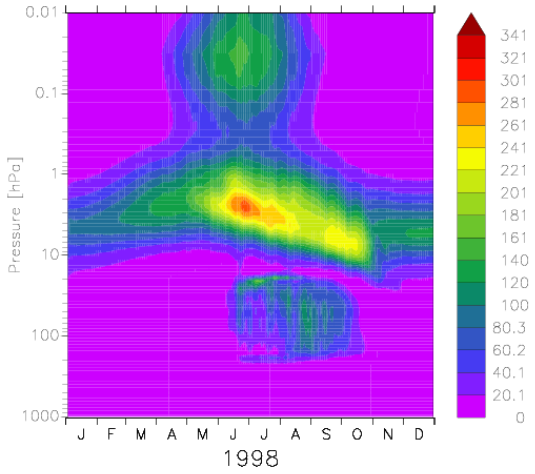
S-E4CHEM

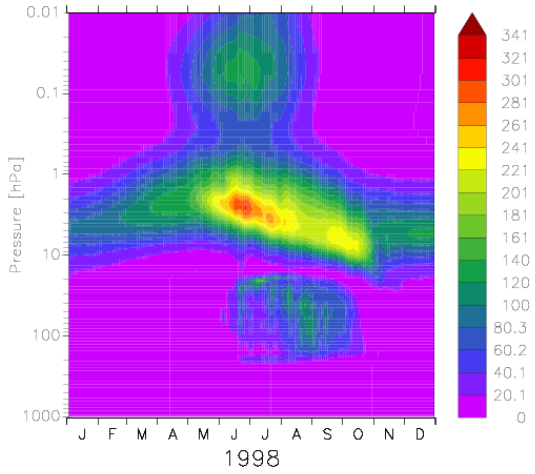
S-MECCA(E4CHEM)

S-MECCA(EVAL)

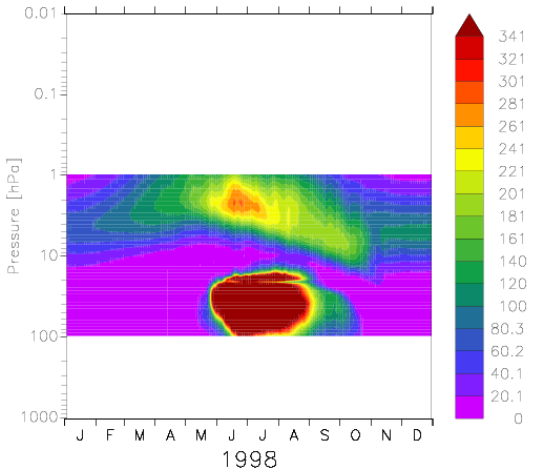
zonal mean HOCl at 60S-90S, [pptv]

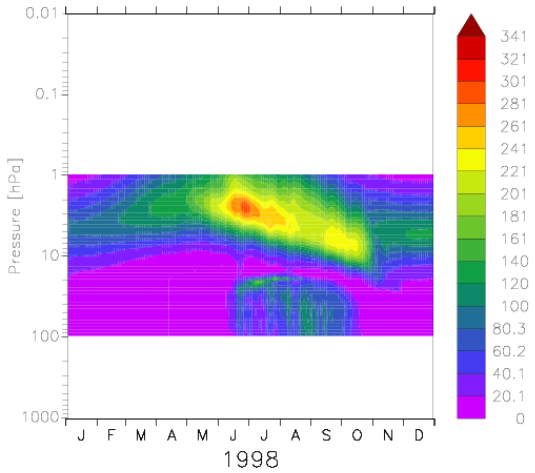


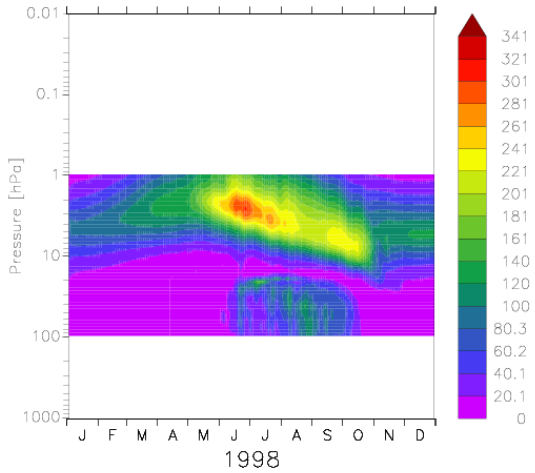




zonal mean HOCl at 60S-90S, [pptv]



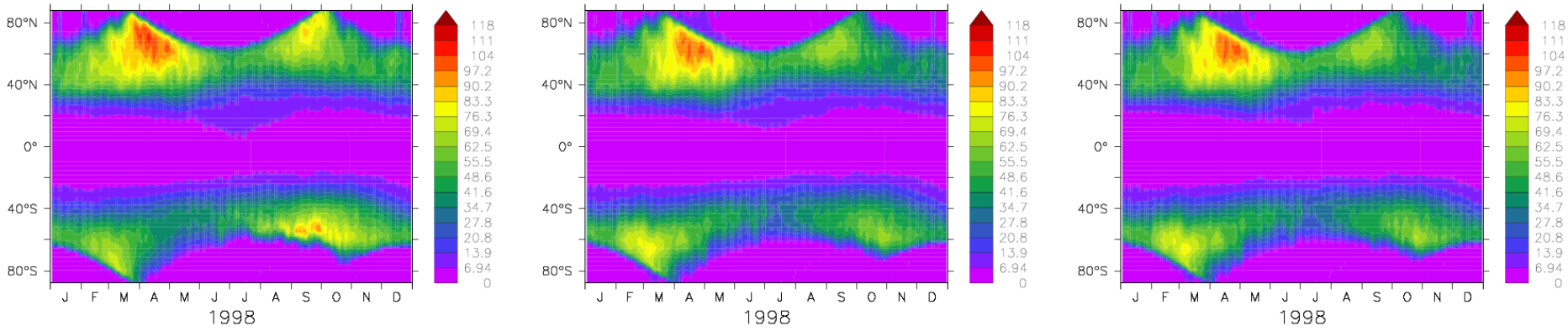
# 8 Species: $N_2O_5$

S-E4CHEM

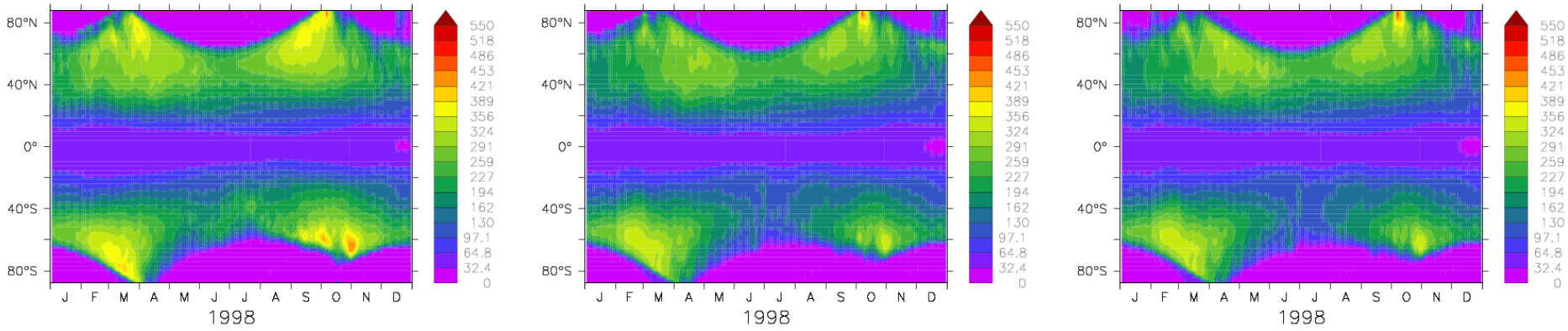
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean N2O5 at 100 hPa, [pptv]




zonal mean N2O5 at 50 hPa, [pptv]

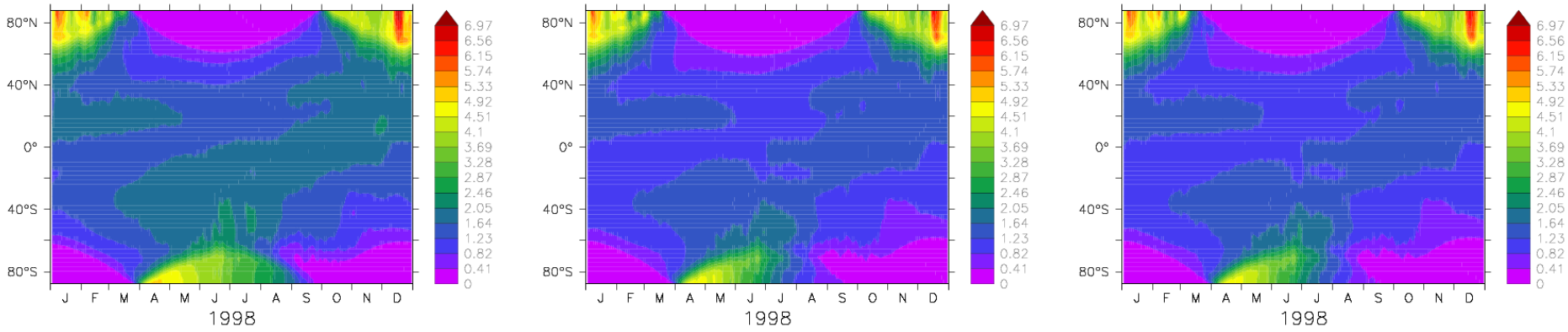


S-E4CHEM

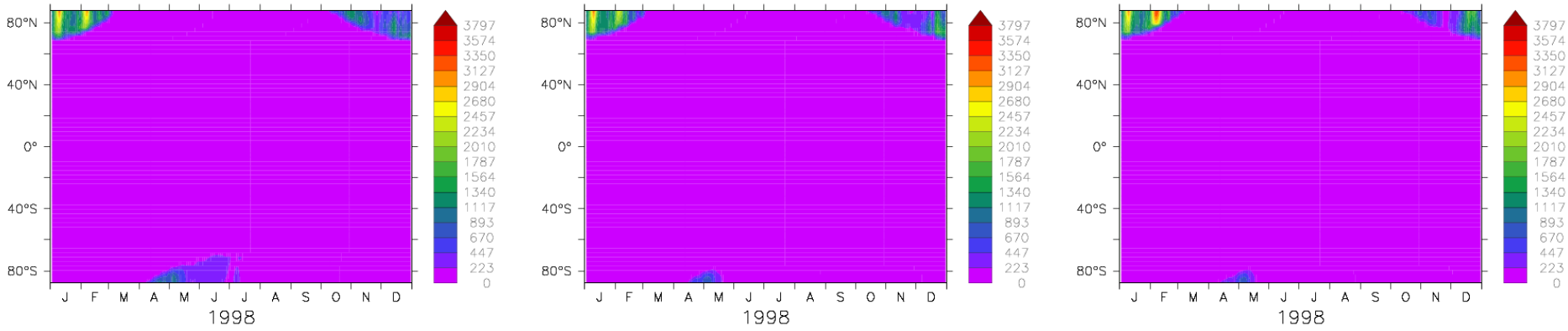
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean N2O5 at 10 hPa, [ppbv]




zonal mean N2O5 at 1 hPa, [pptv]

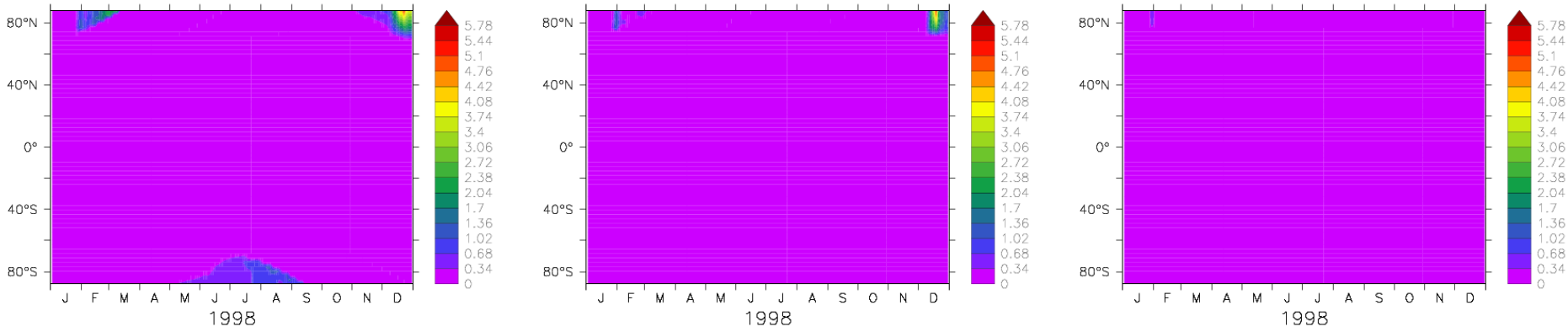


S-E4CHEM

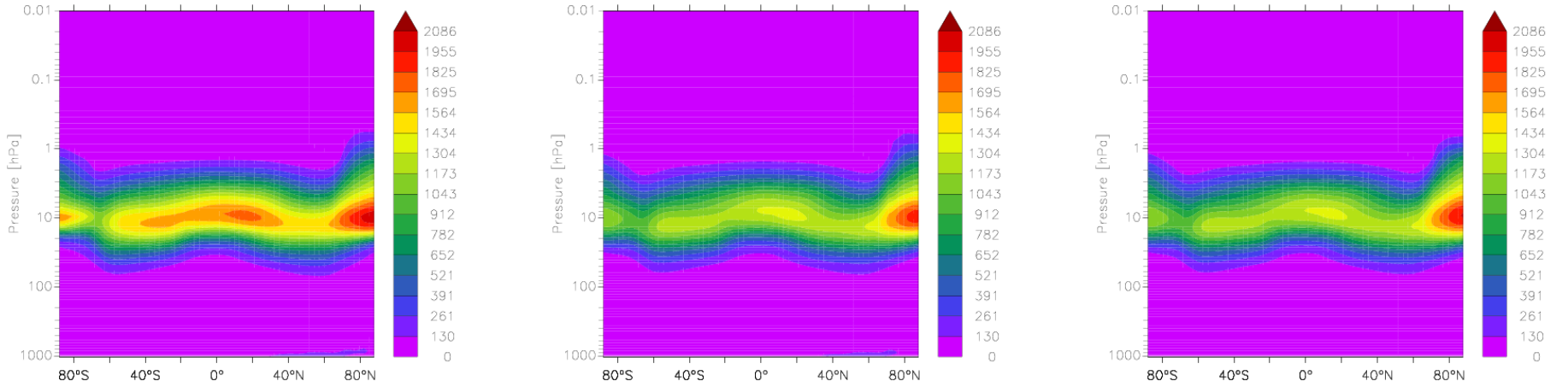
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean N2O5 at 0.1 hPa, [pptv]




zonal mean N2O5 at t=1-Jan-1998:31-Dec-1998, [pptv]

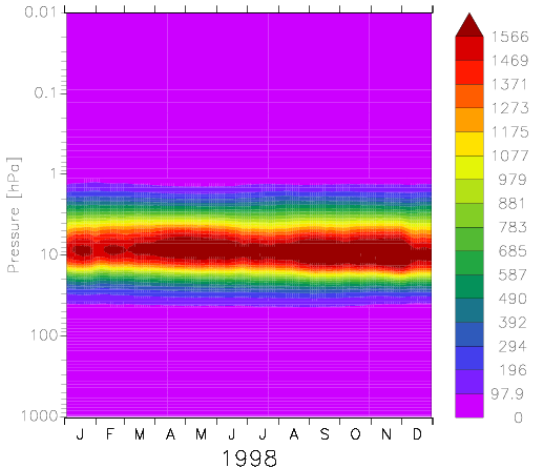


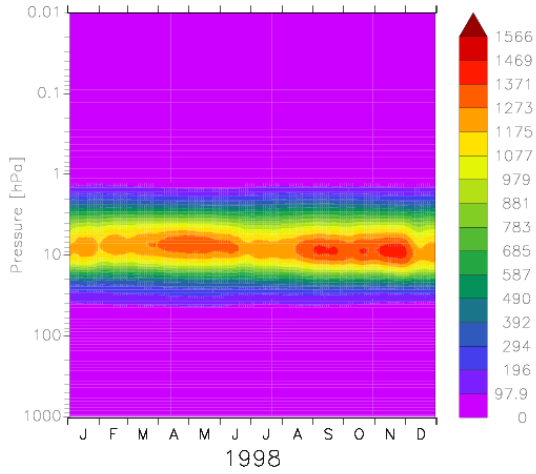
S-E4CHEM

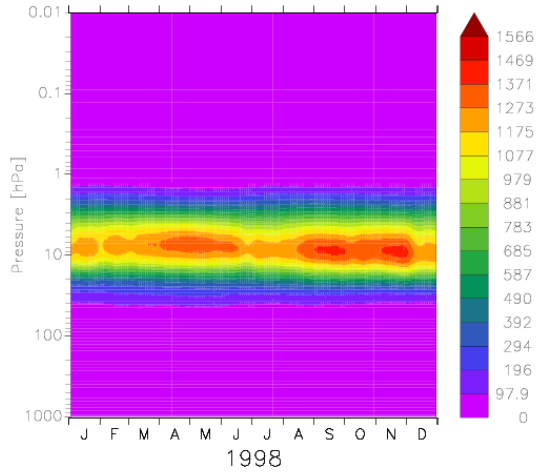
S-MECCA(E4CHEM)

S-MECCA(EVAL)

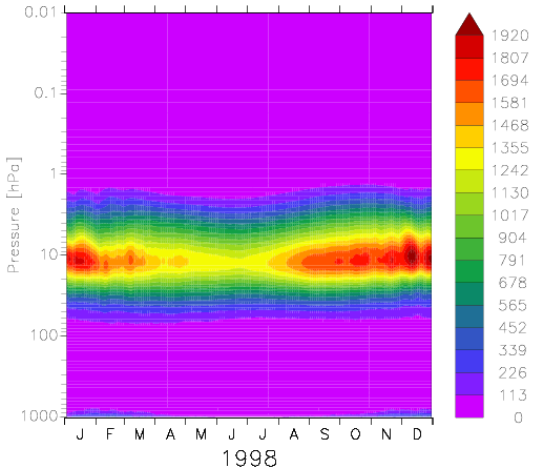
zonal mean N2O5 at 20S-20N, [pptv]

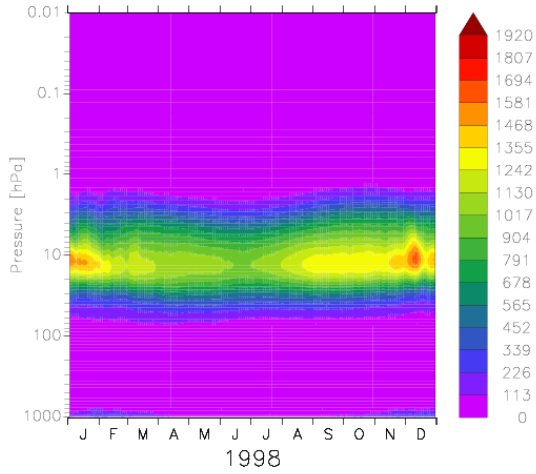


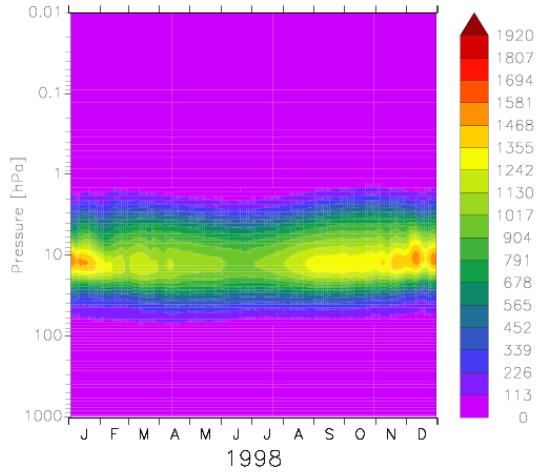




zonal mean N2O5 at 30N-50N, [pptv]



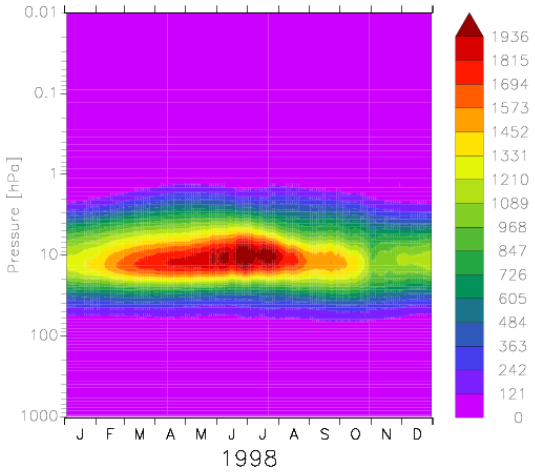



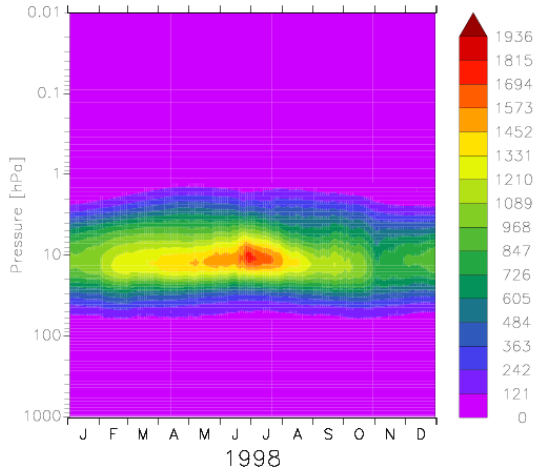
S-E4CHEM

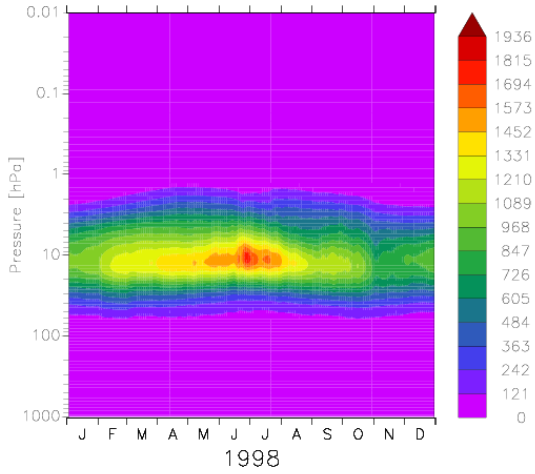
S-MECCA(E4CHEM)

S-MECCA(EVAL)

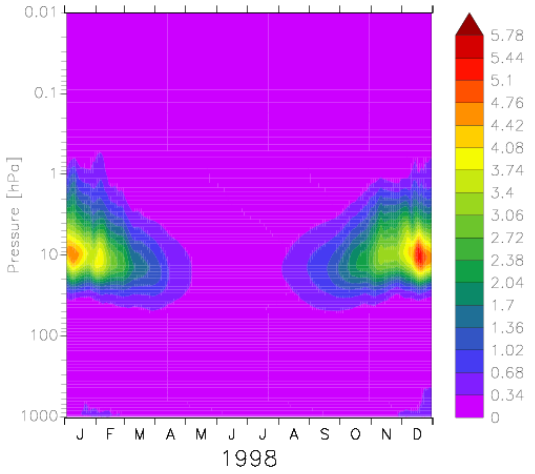
zonal mean N2O5 at 30S-50S, [pptv]

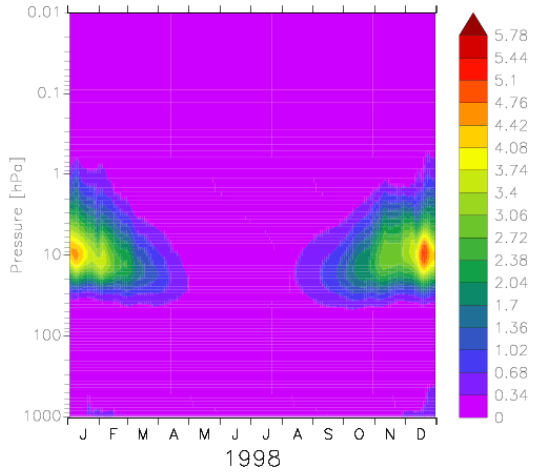


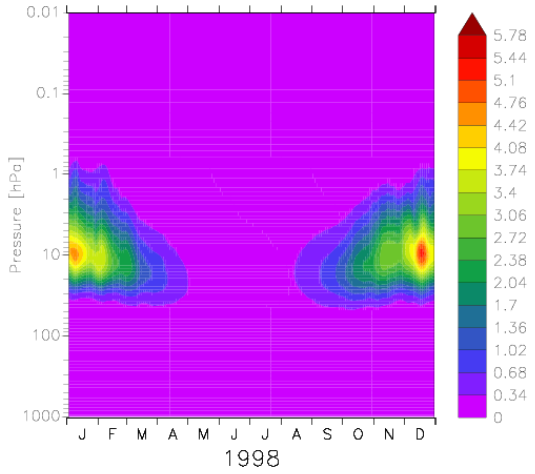




zonal mean N2O5 at 60N-90N, [ppbv]



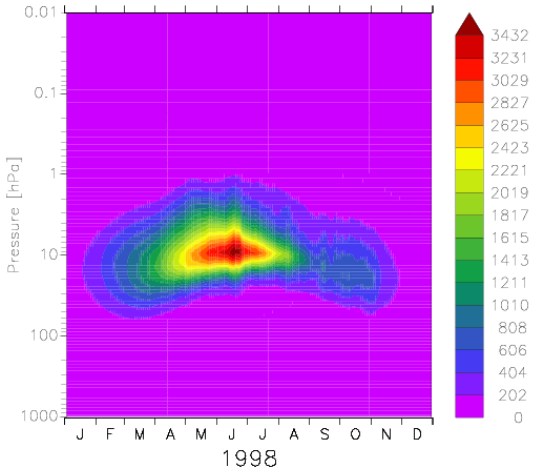



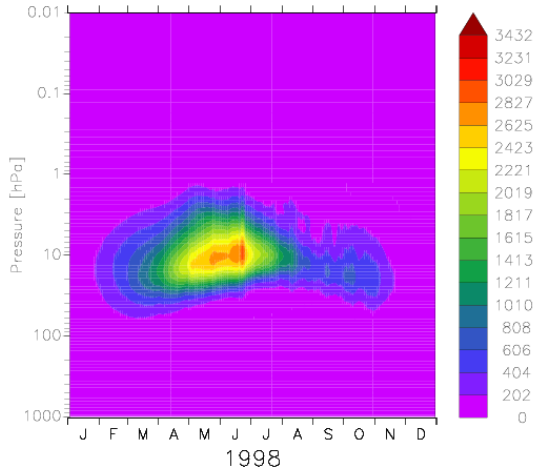
S-E4CHEM

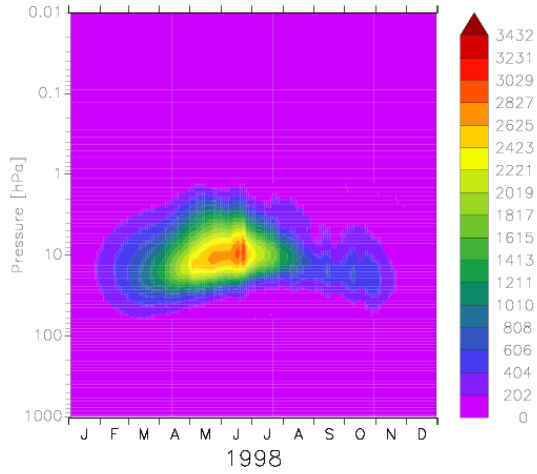
S-MECCA(E4CHEM)

S-MECCA(EVAL)

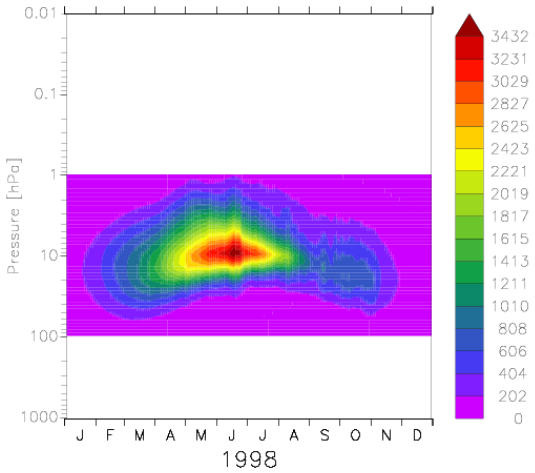
zonal mean N2O5 at 60S-90S, [pptv]

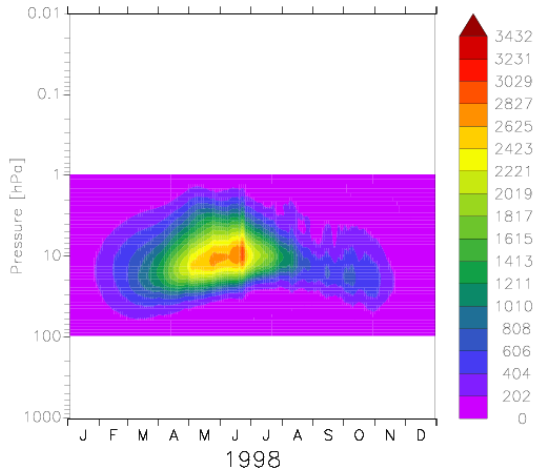


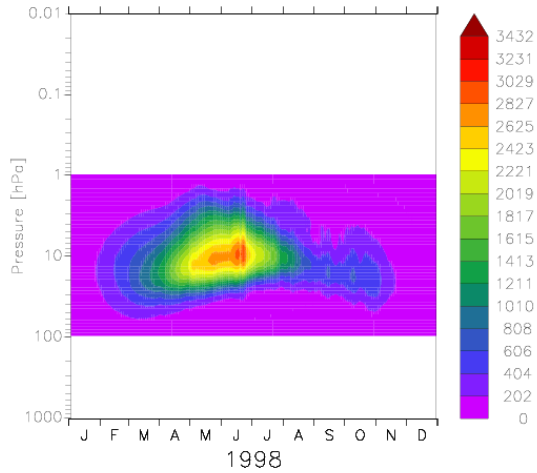




zonal mean N2O5 at 60S-90S, [pptv]



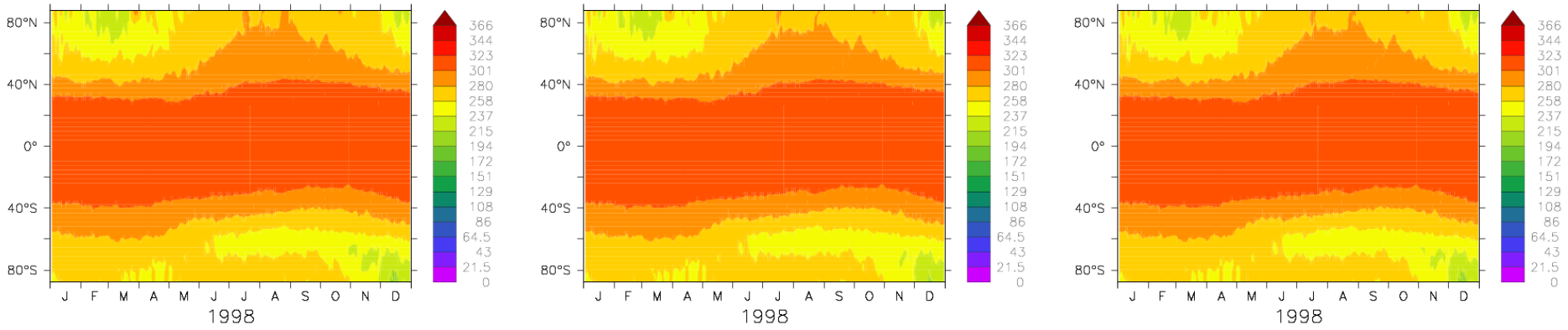
# 9 Species: $N_2O$

S-E4CHEM

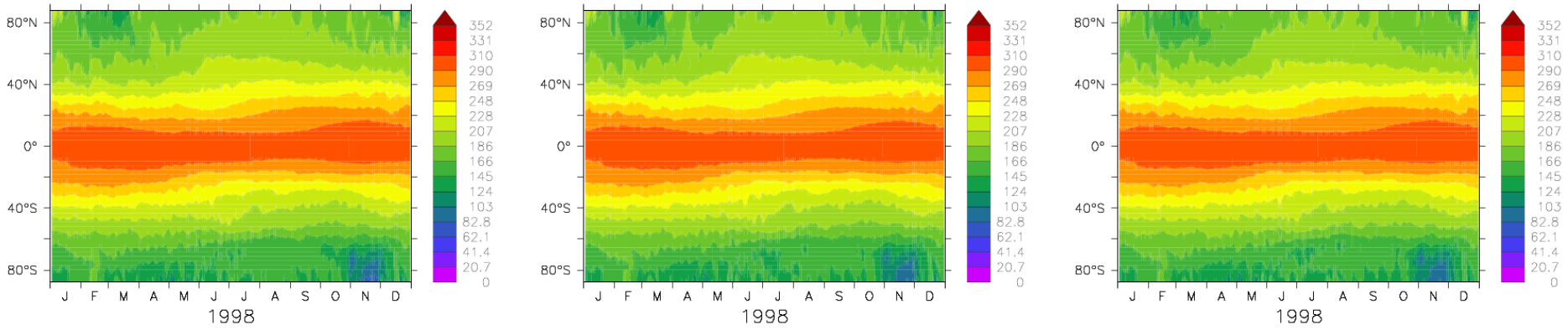
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean N2O at 100 hPa, [ppbv]




zonal mean N2O at 50 hPa, [ppbv]

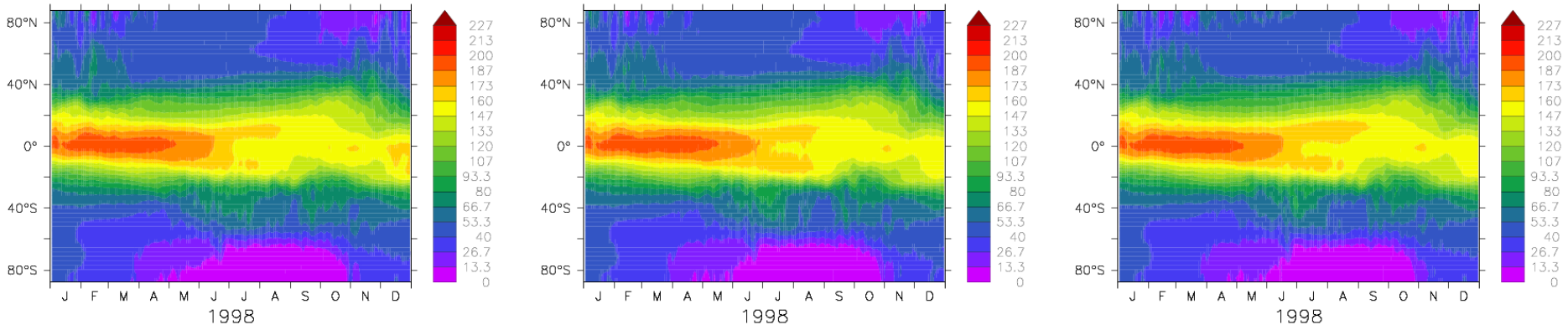


S-E4CHEM

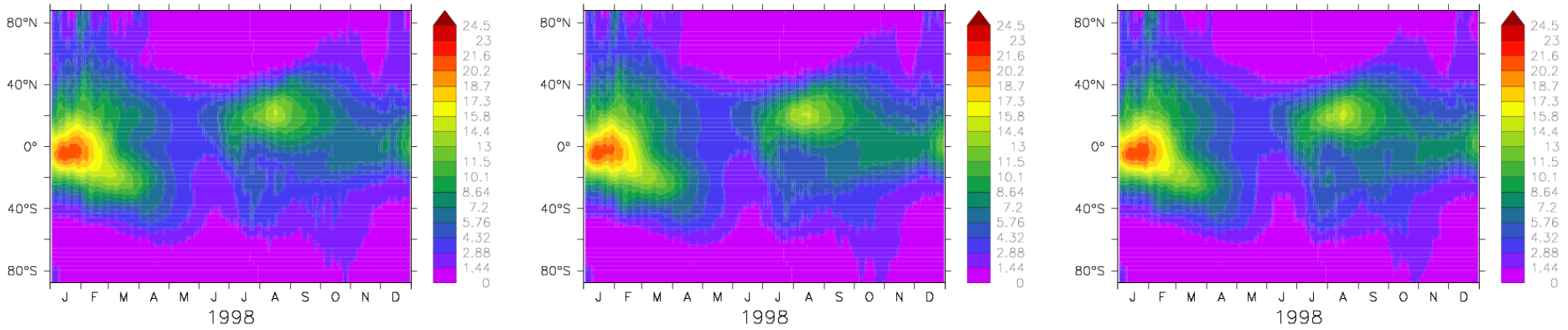
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean N2O at 10 hPa, [ppbv]




zonal mean N2O at 1 hPa, [ppbv]

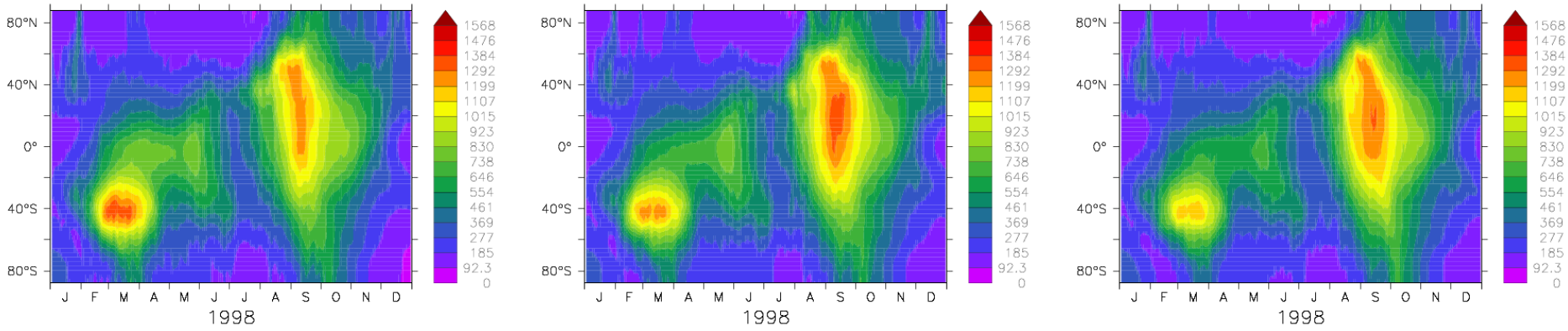


S-E4CHEM

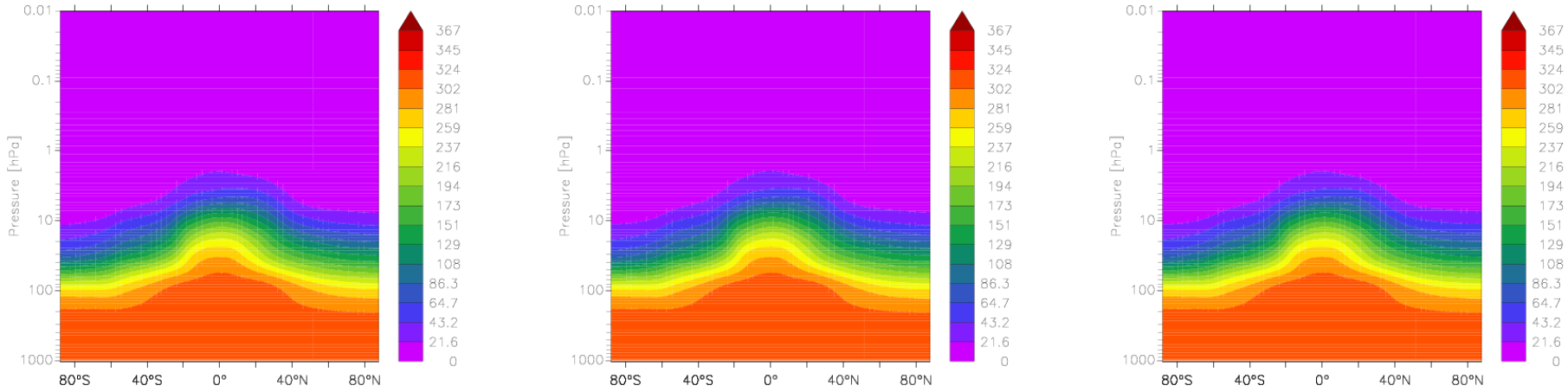
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean N2O at 0.1 hPa, [pptv]




zonal mean N2O at t=1-Jan-1998:31-Dec-1998, [ppbv]

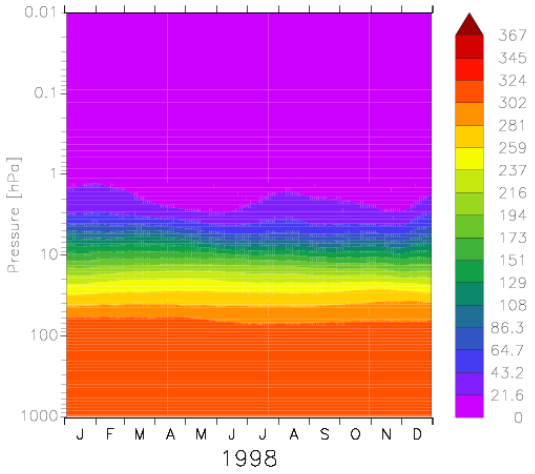


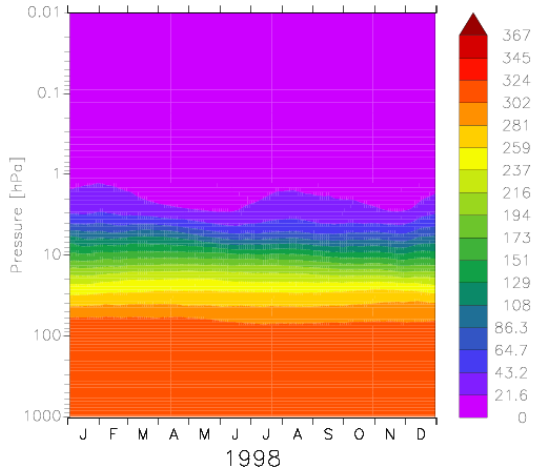
S-E4CHEM

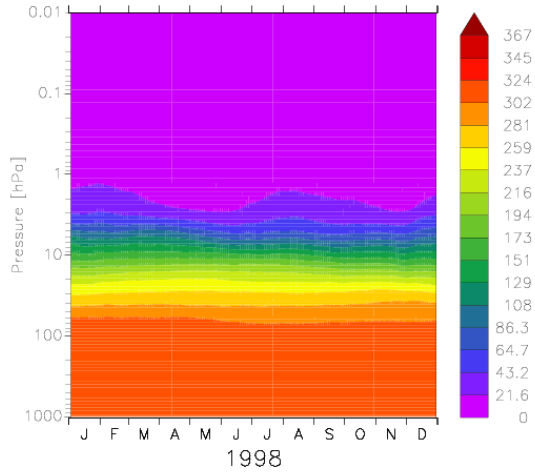
S-MECCA(E4CHEM)

S-MECCA(EVAL)

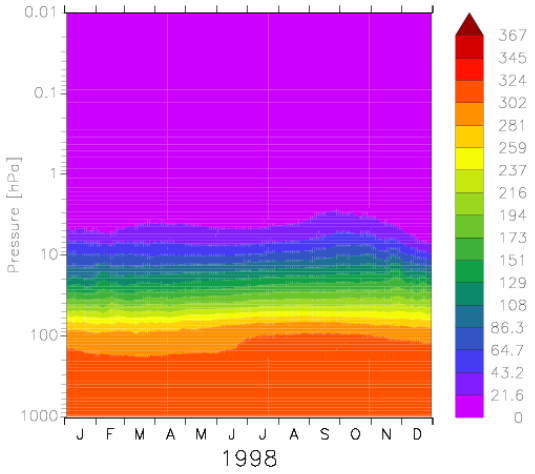
zonal mean N2O at 20S-20N, [ppbv]

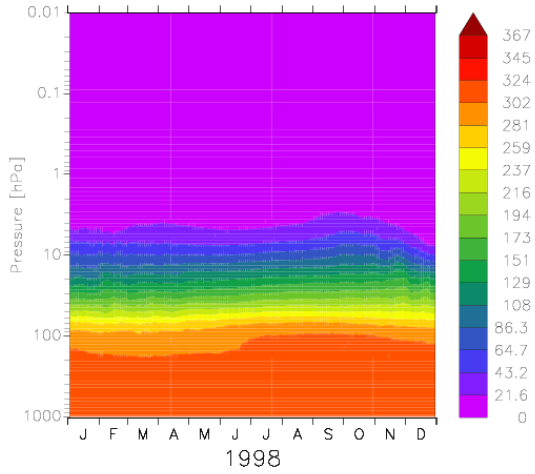


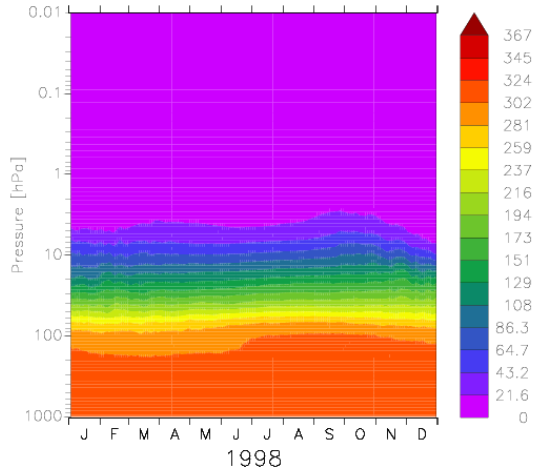




zonal mean N2O at 30N-50N, [ppbv]



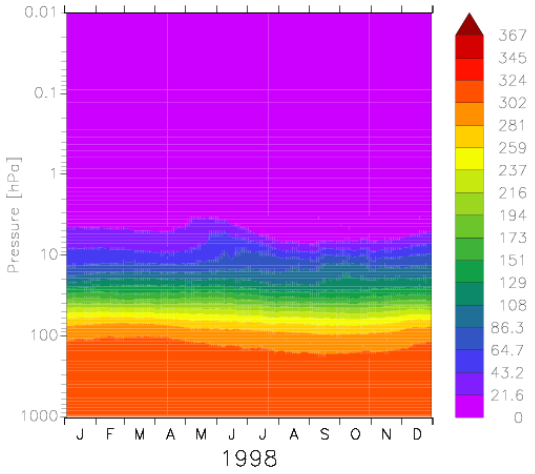



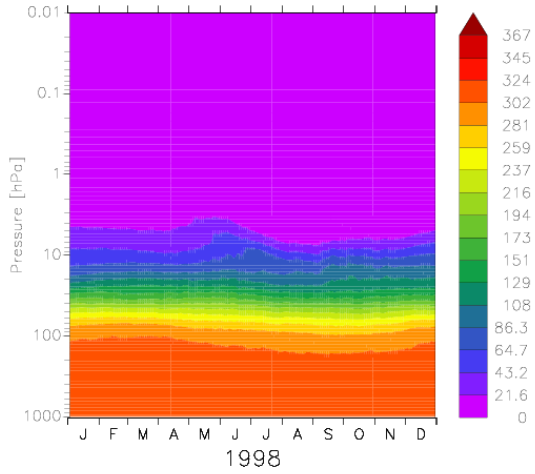
S-E4CHEM

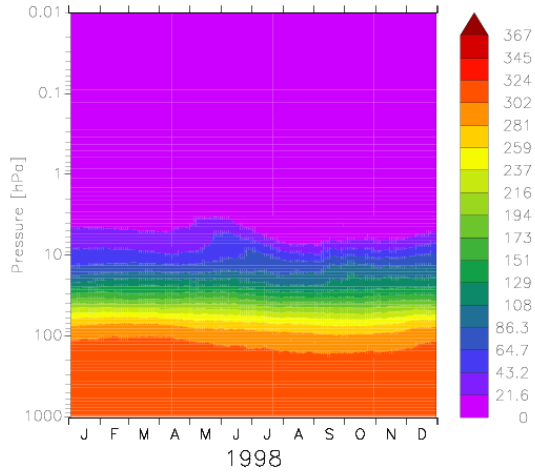
S-MECCA(E4CHEM)

S-MECCA(EVAL)

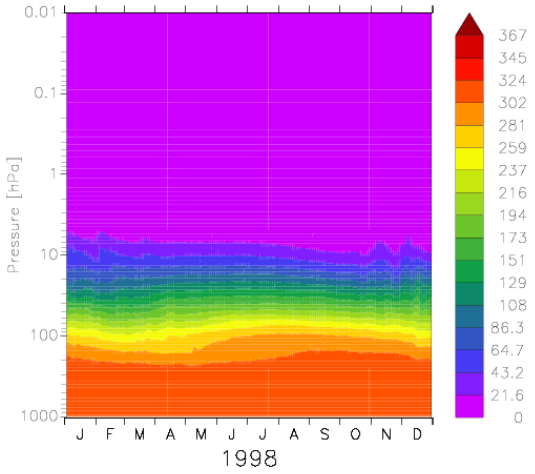
zonal mean N2O at 30S-50S, [ppbv]

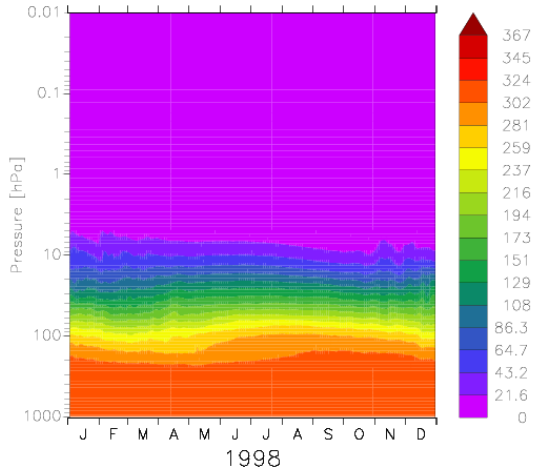


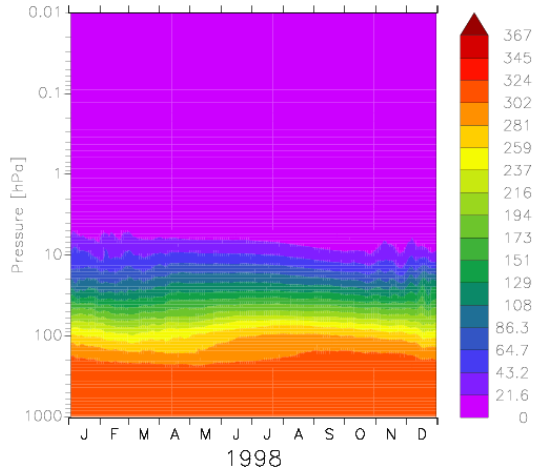



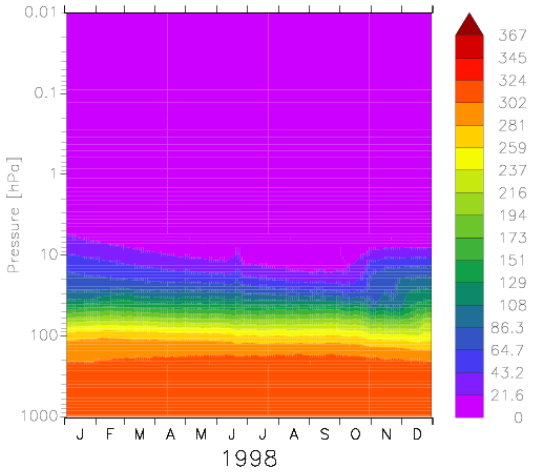

zonal mean N2O at 60N-90N, [ppbv]



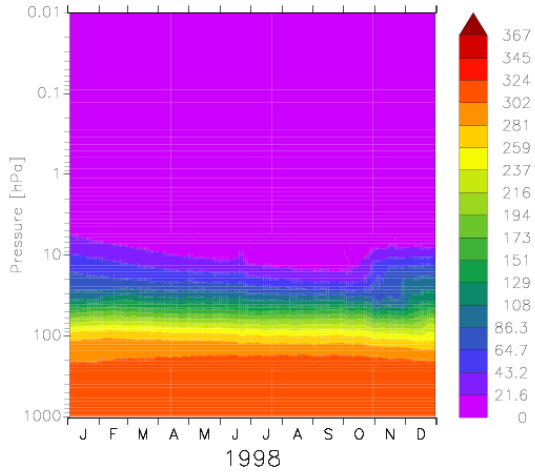



S-E4CHEM

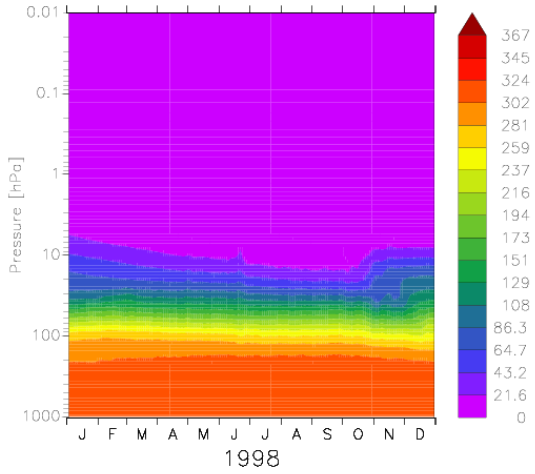


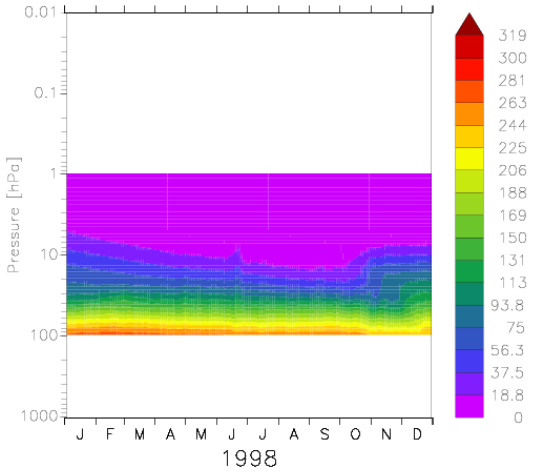

S-MECCA(E4CHEM)

zonal mean N2O at 60S-90S, [ppbv]

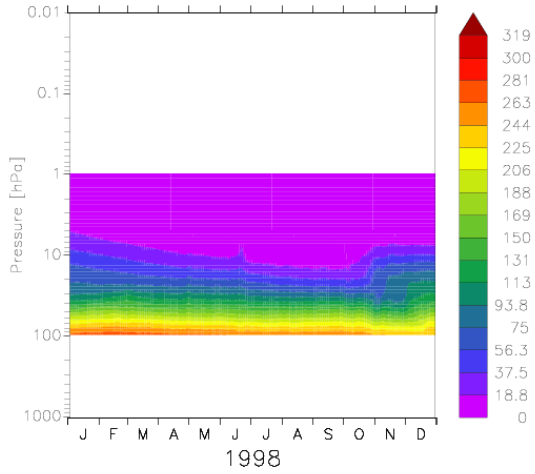


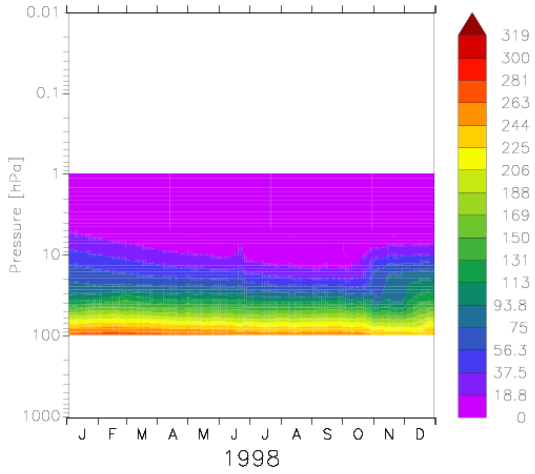

S-MECCA(EVAL)




zonal mean N2O at 60S-90S, [ppbv]



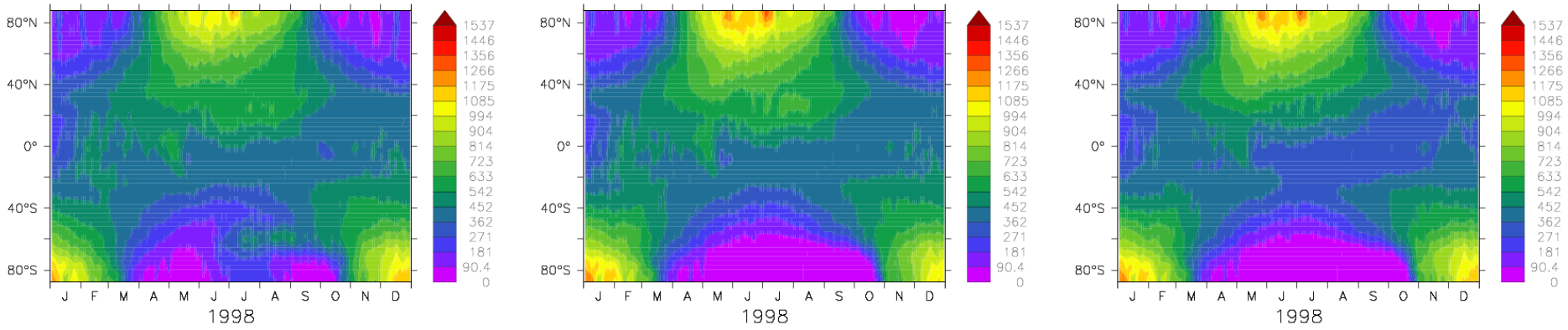
# 10 Species: NOx

S-E4CHEM

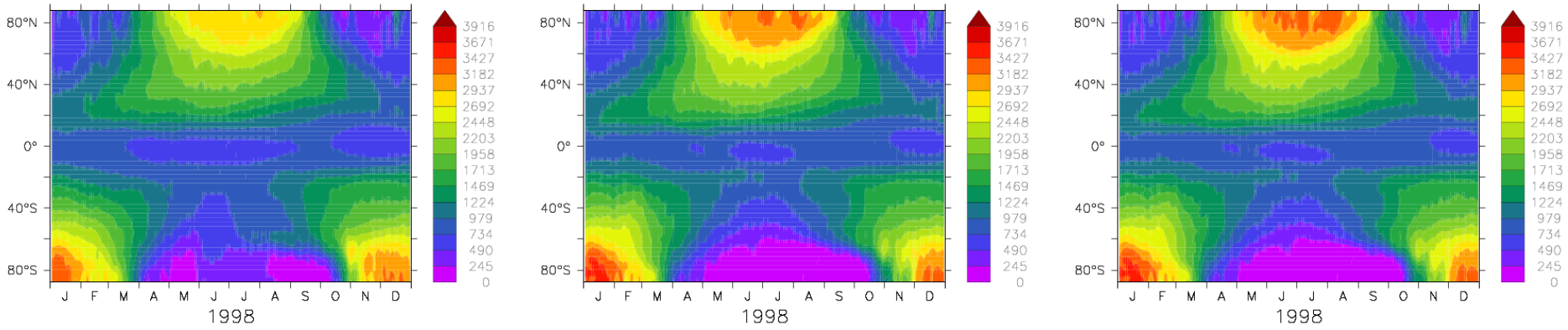
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean NOX at 100 hPa, [pptv]




zonal mean NOX at 50 hPa, [pptv]

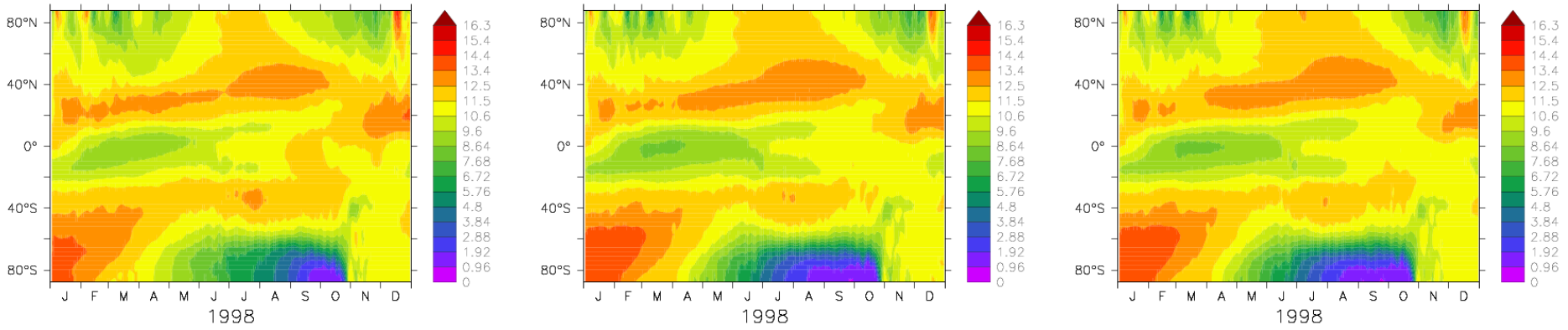


S-E4CHEM

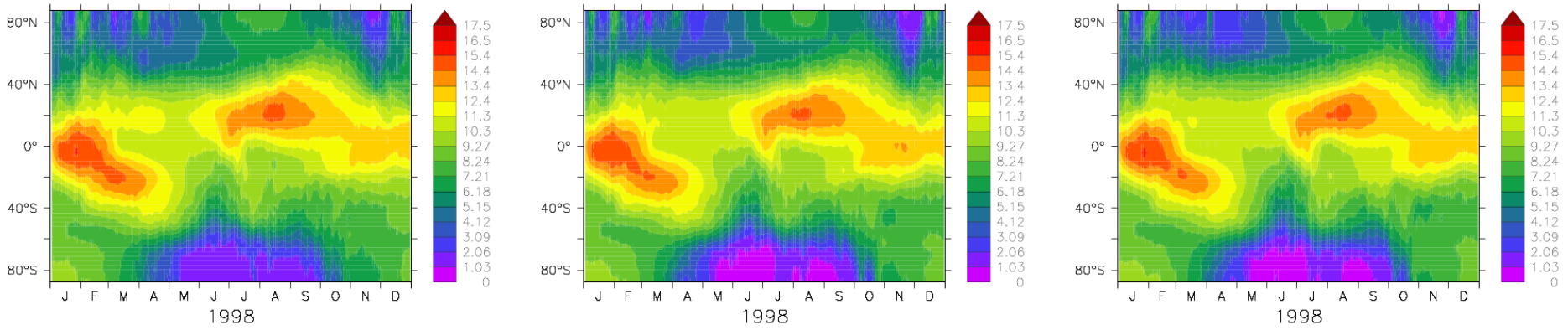
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean NOX at 10 hPa, [ppbv]




zonal mean NOX at 1 hPa, [ppbv]

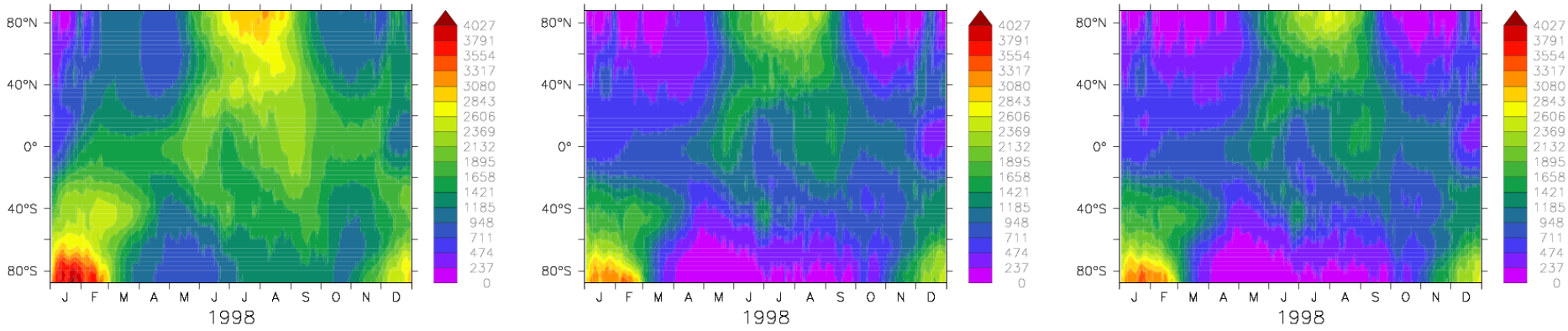


S-E4CHEM

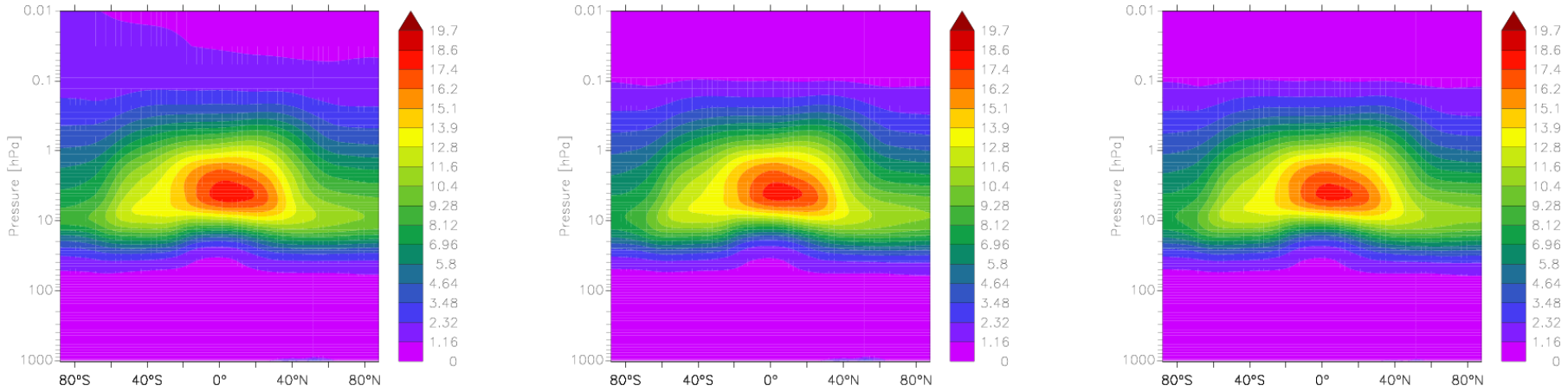
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean NOX at 0.1 hPa, [pptv]




zonal mean NOX at t=1-Jan-1998:31-Dec-1998, [ppbv]

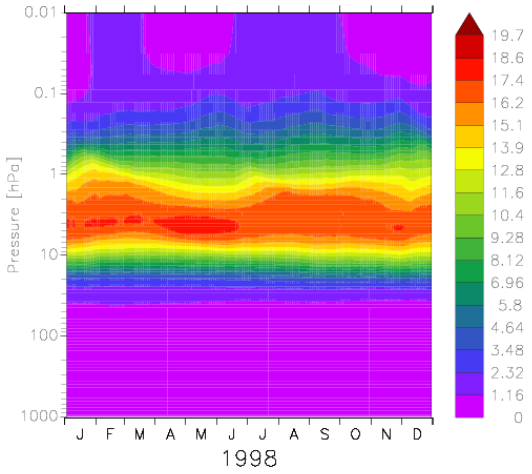


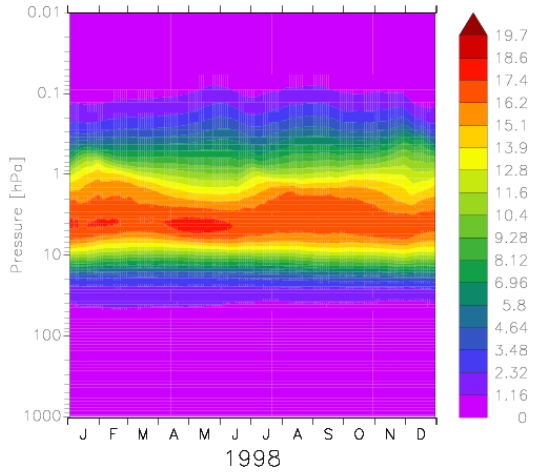
S-E4CHEM

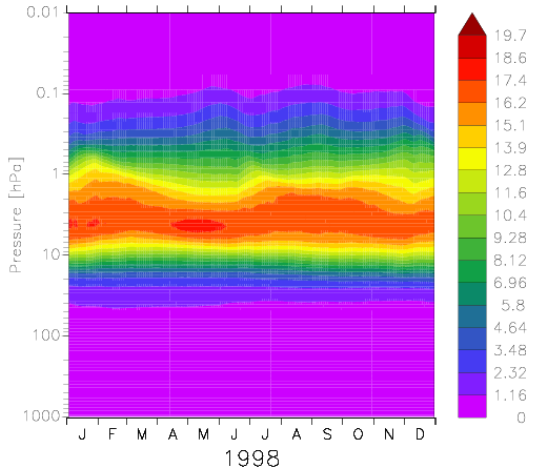
S-MECCA(E4CHEM)

S-MECCA(EVAL)

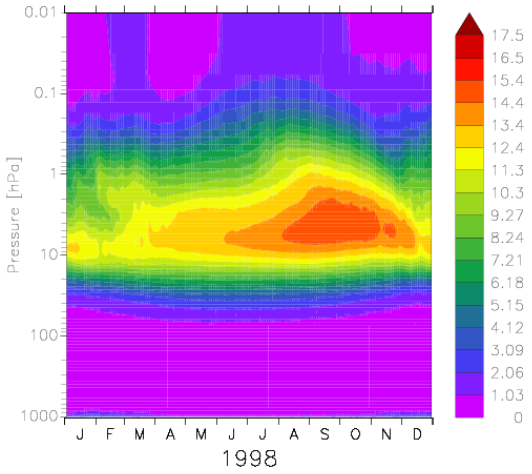
zonal mean NOX at 20S-20N, [ppbv]

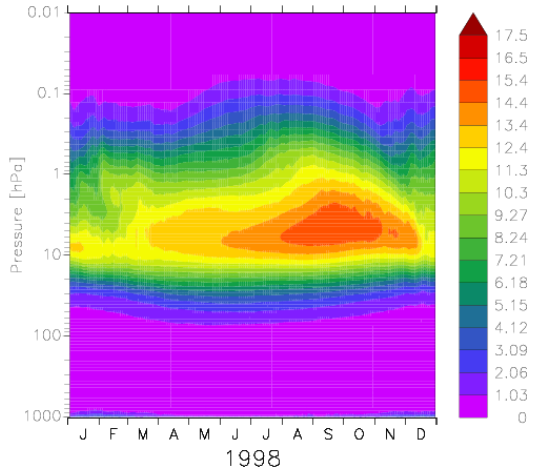


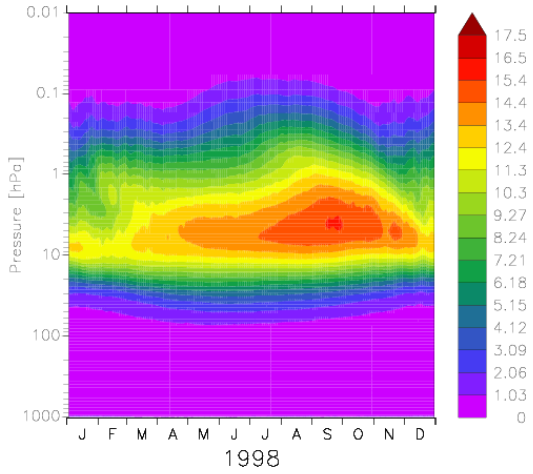




zonal mean NOX at 30N-50N, [ppbv]



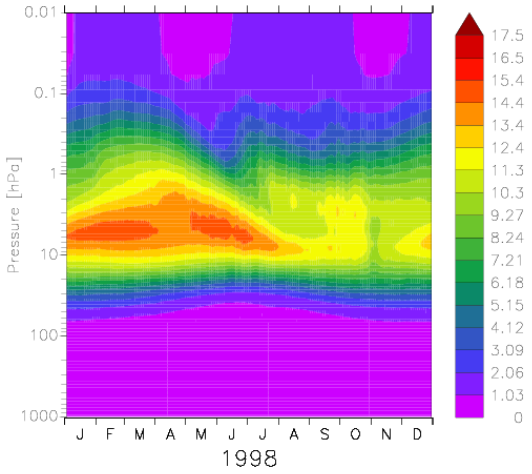



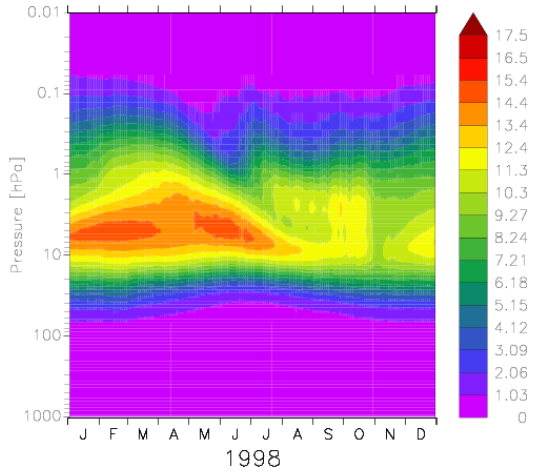
S-E4CHEM

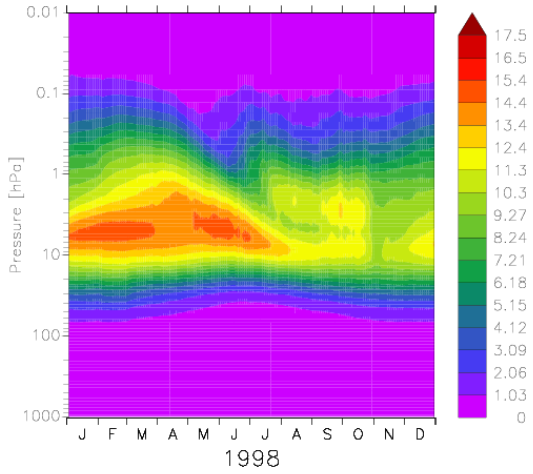
S-MECCA(E4CHEM)

S-MECCA(EVAL)

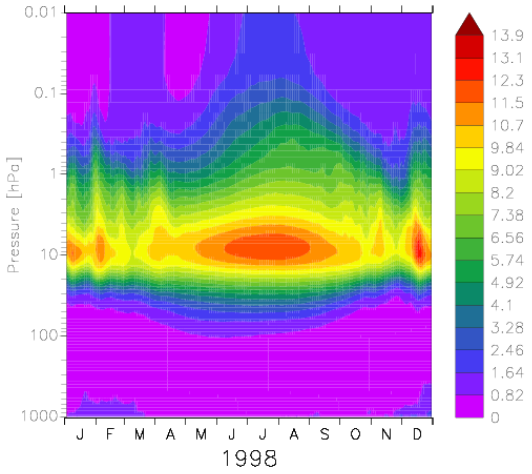
zonal mean NOX at 30S-50S, [ppbv]

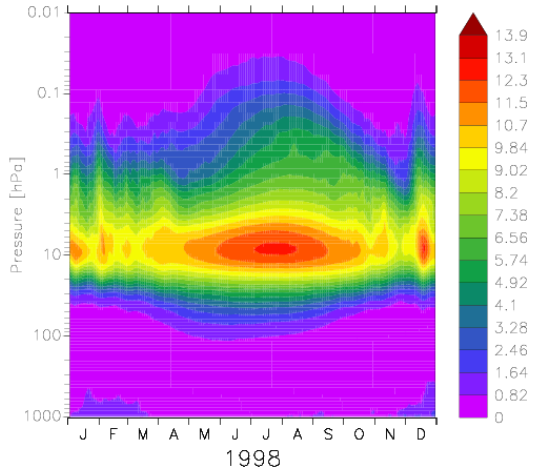


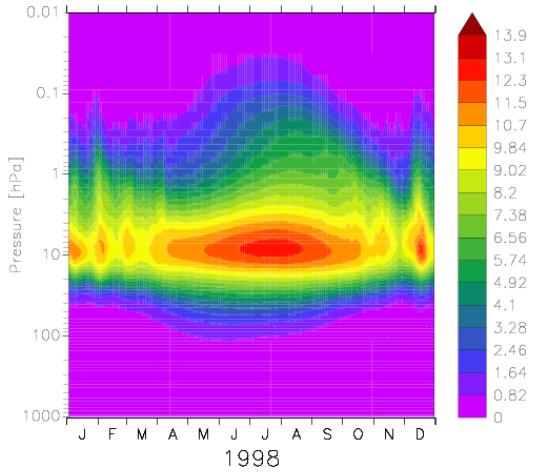




zonal mean NOX at 60N-90N, [ppbv]



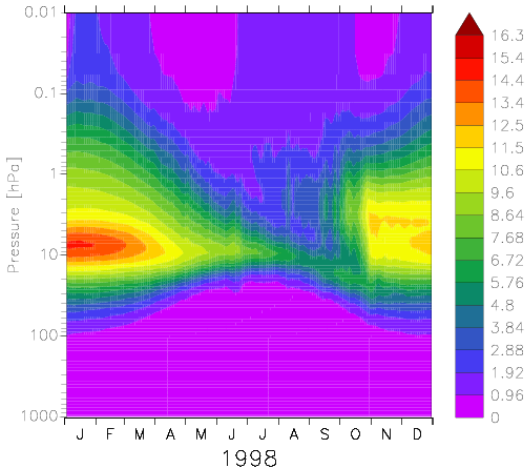



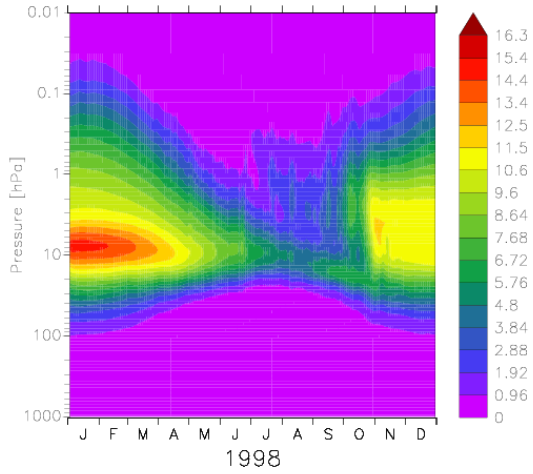
S-E4CHEM

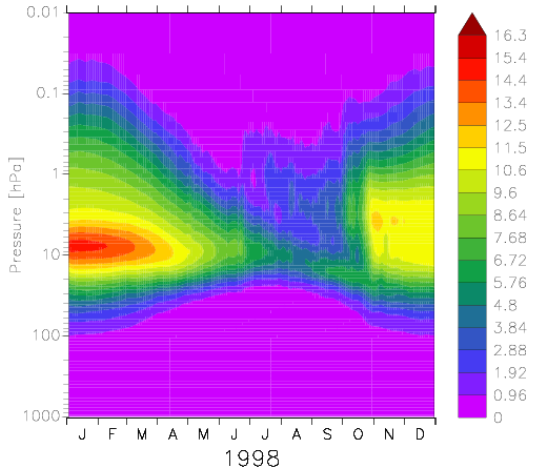
S-MECCA(E4CHEM)

S-MECCA(EVAL)

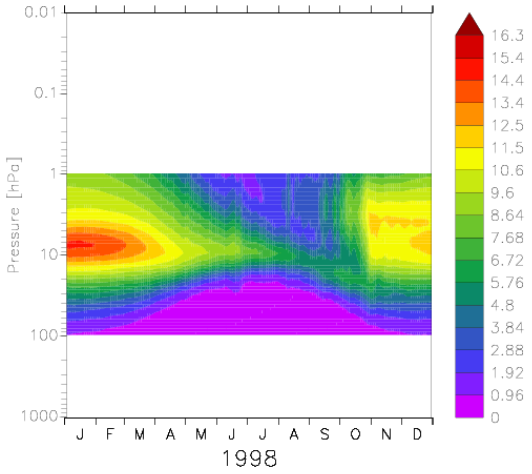
zonal mean NOX at 60S-90S, [ppbv]

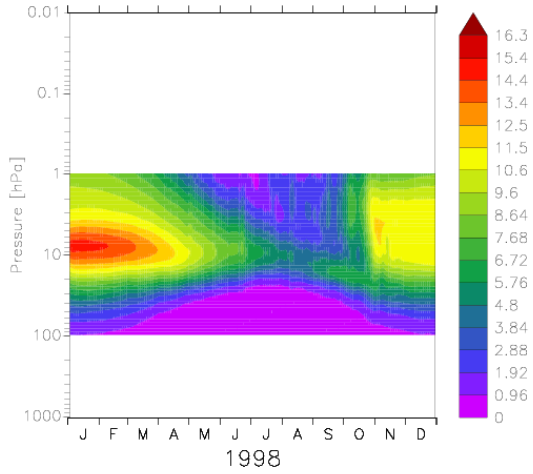


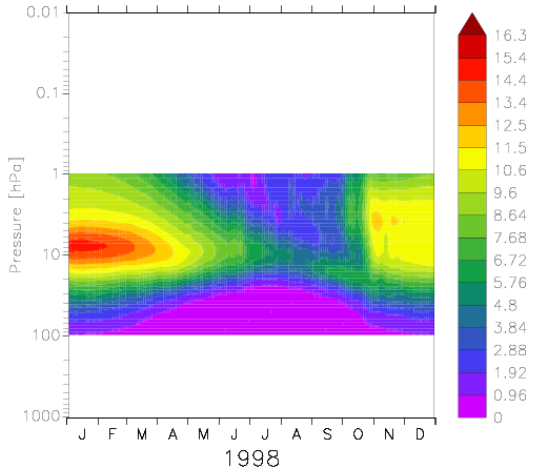




zonal mean NOX at 60S-90S, [ppbv]



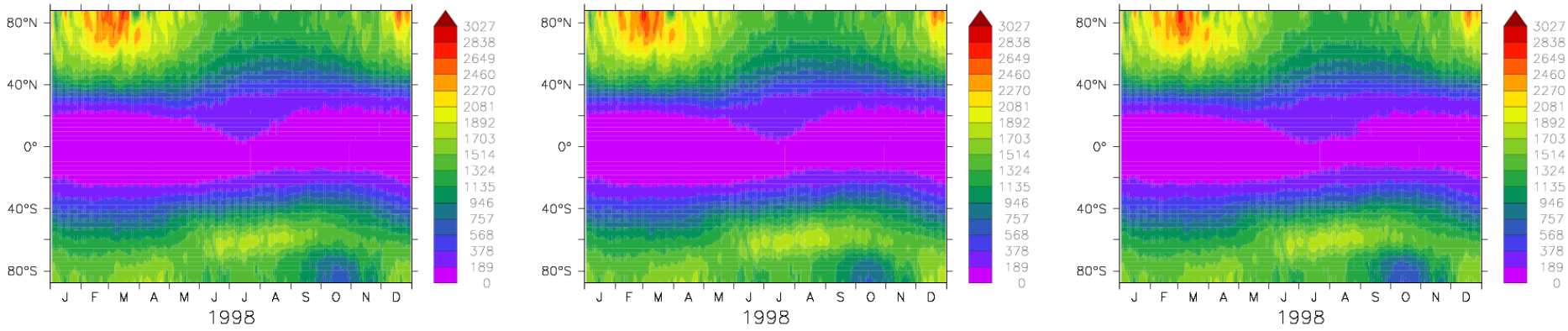
# 11 Species: $O_3$

S-E4CHEM

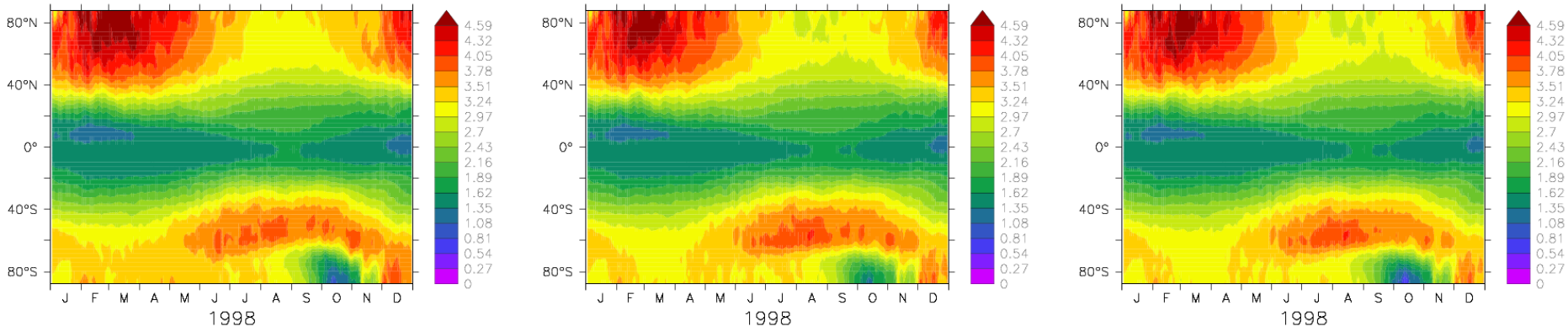
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean O3 at 100 hPa, [ppbv]




zonal mean O3 at 50 hPa, [ppmv]

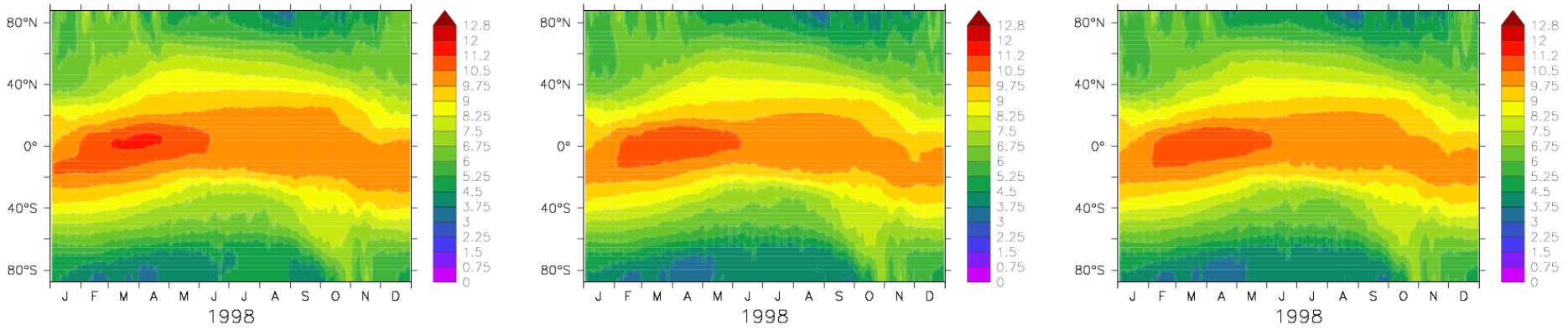


S-E4CHEM

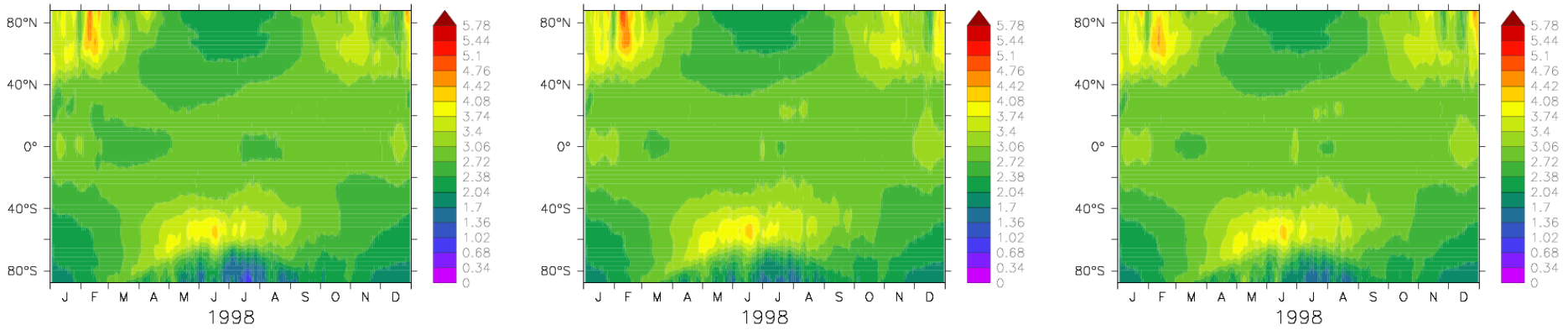
S-MECCA(E4CHEM)

S-MECCA(EVAL)

zonal mean O3 at 10 hPa, [ppmv]

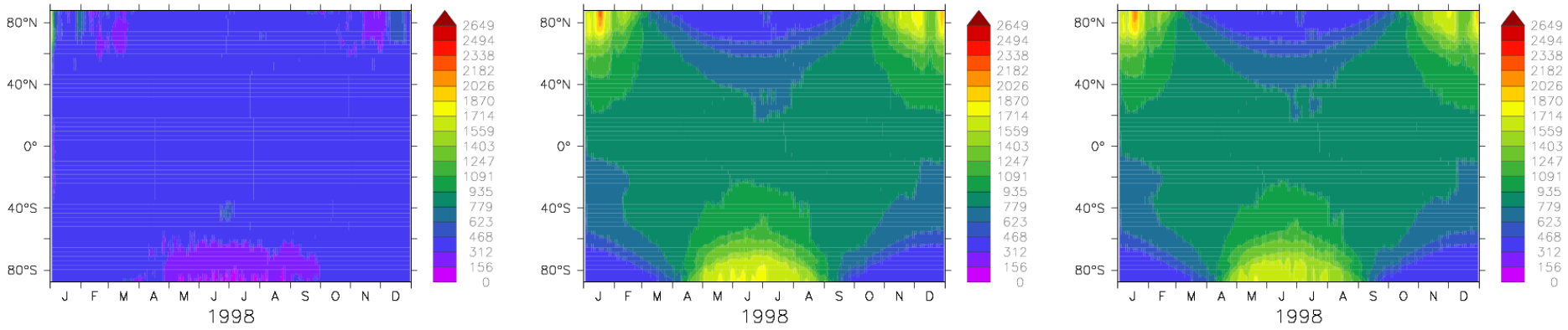



zonal mean O3 at 1 hPa, [ppmv]

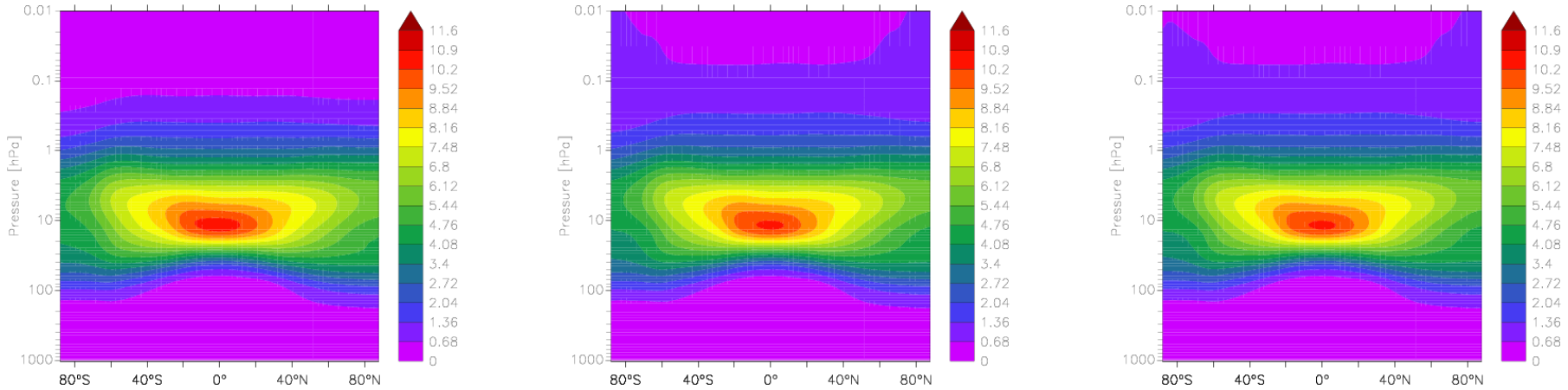


S-E4CHEM | S-MECCA(E4CHEM) | S-MECCA(EVAL)

zonal mean O3 at 0.1 hPa, [ppbv]




zonal mean O3 at t=1-Jan-1998:31-Dec-1998, [ppmv]

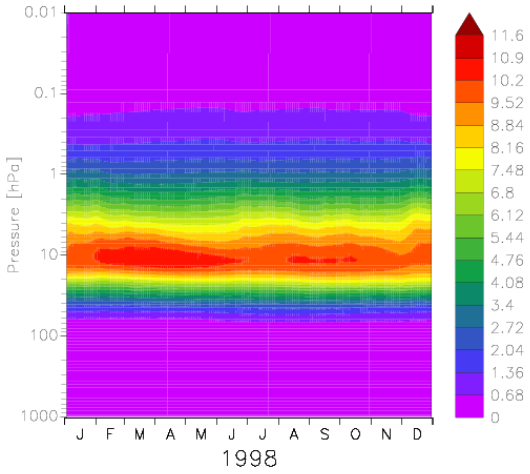


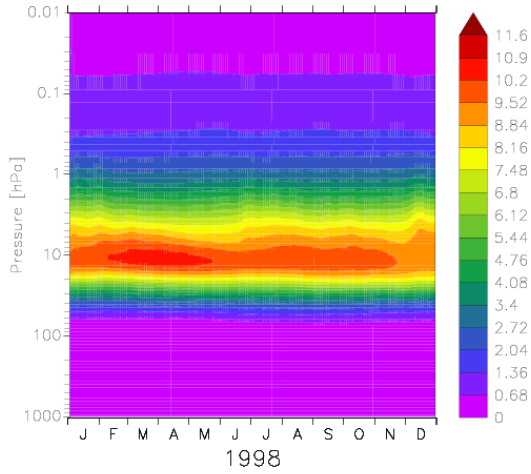
S-E4CHEM

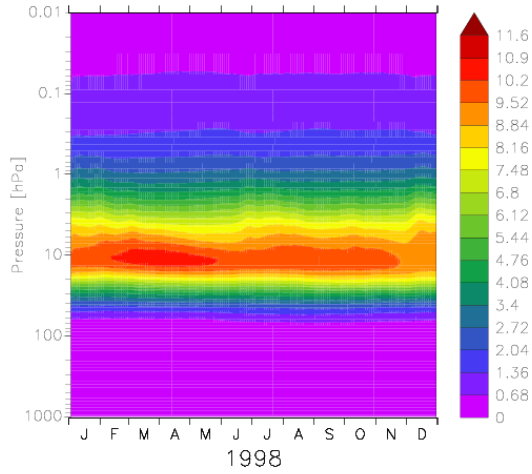
S-MECCA(E4CHEM)

S-MECCA(EVAL)

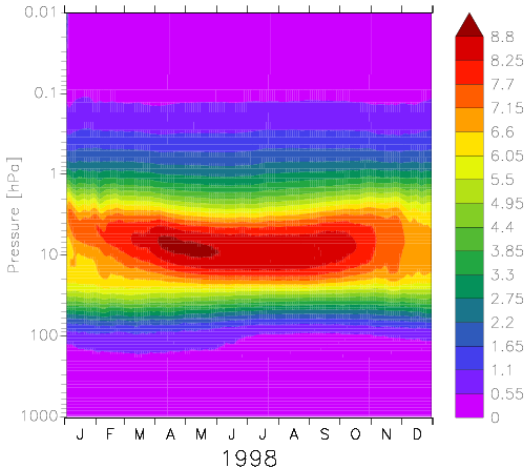
zonal mean O3 at 20S-20N, [ppmv]

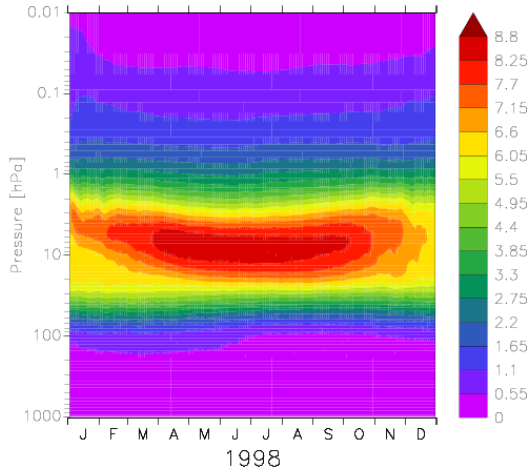


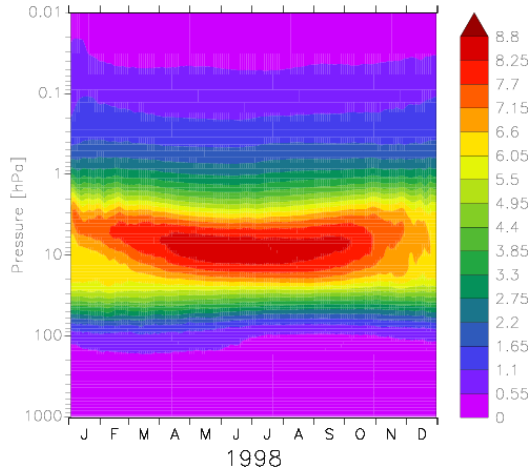




zonal mean O3 at 30N-50N, [ppmv]



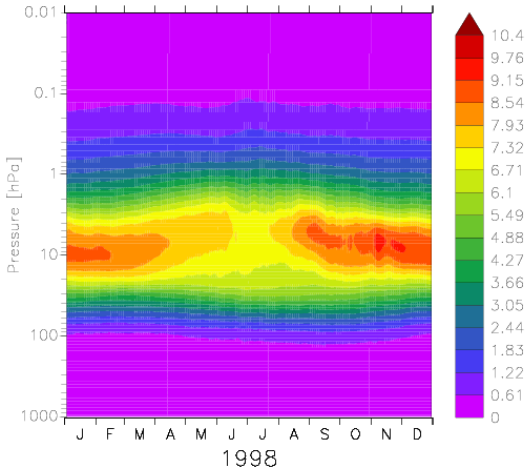



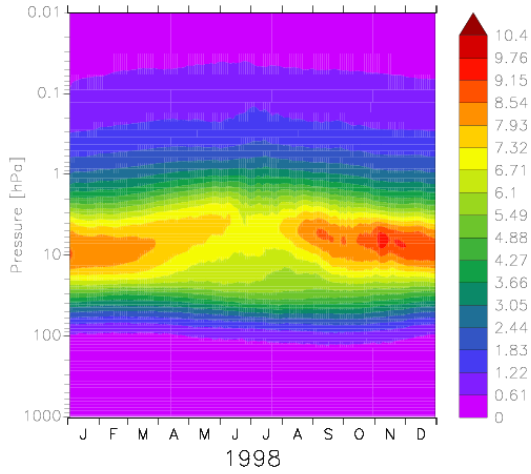
S-E4CHEM

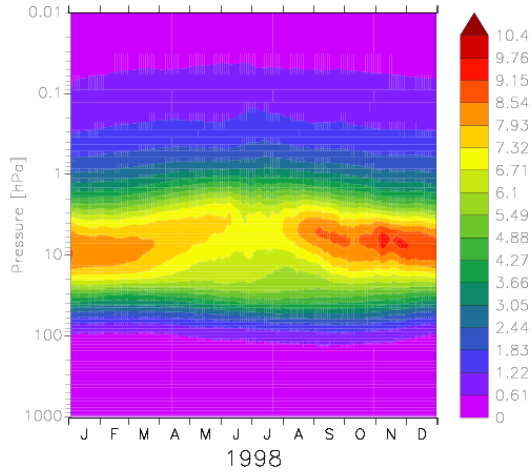
S-MECCA(E4CHEM)

S-MECCA(EVAL)

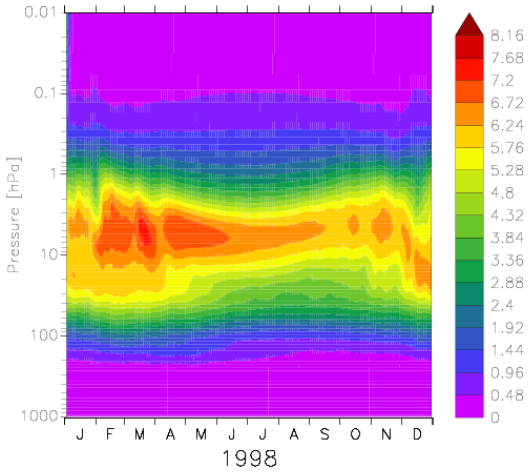
zonal mean O3 at 30S-50S, [ppmv]

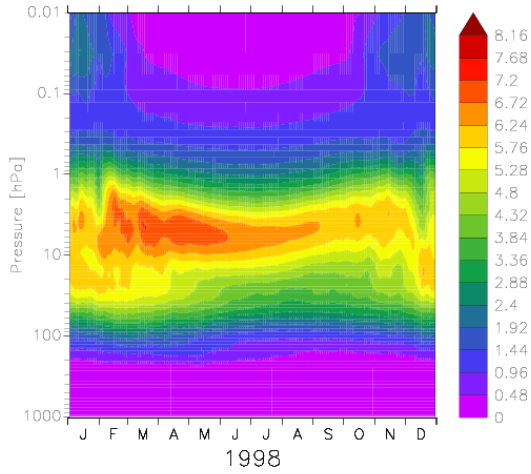


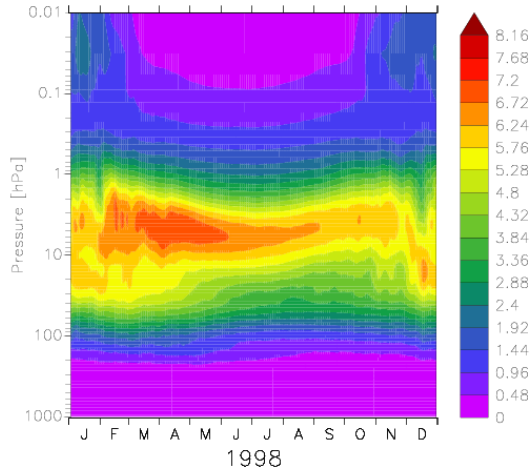




zonal mean O3 at 60N-90N, [ppmv]



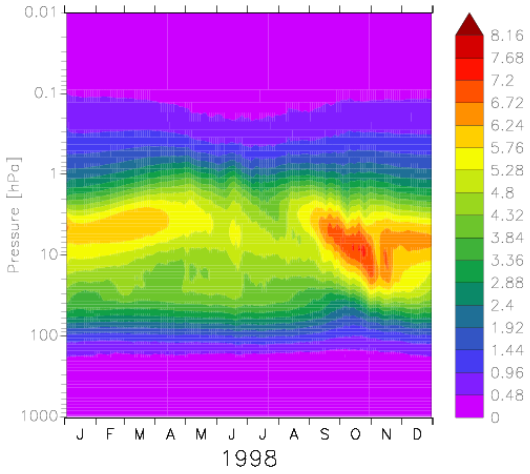



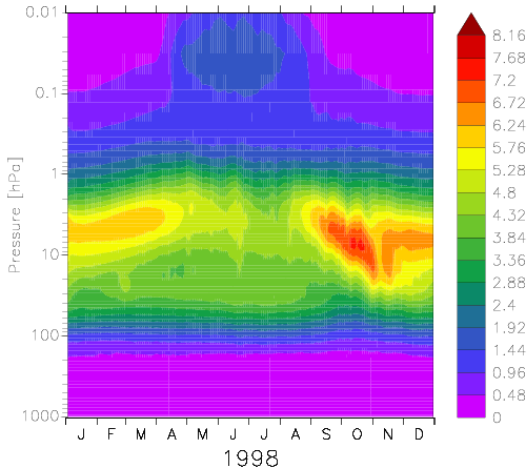
S-E4CHEM

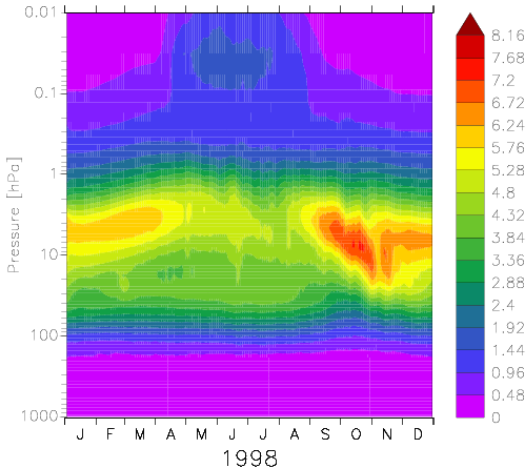
S-MECCA(E4CHEM)

S-MECCA(EVAL)

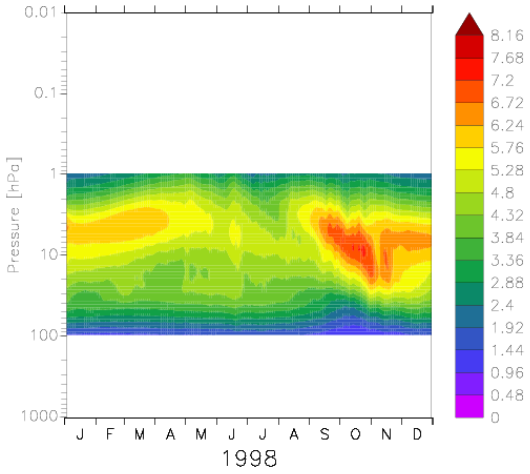
zonal mean O3 at 60S-90S, [ppmv]

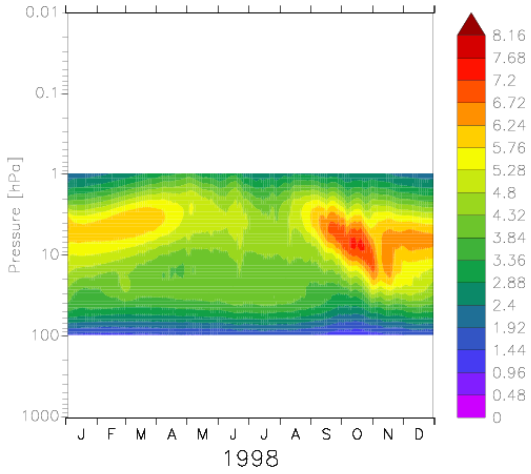


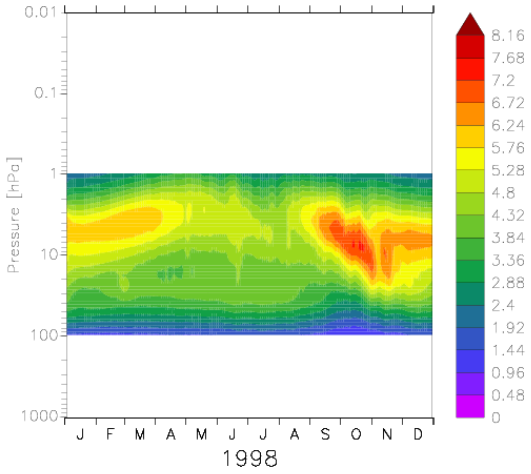



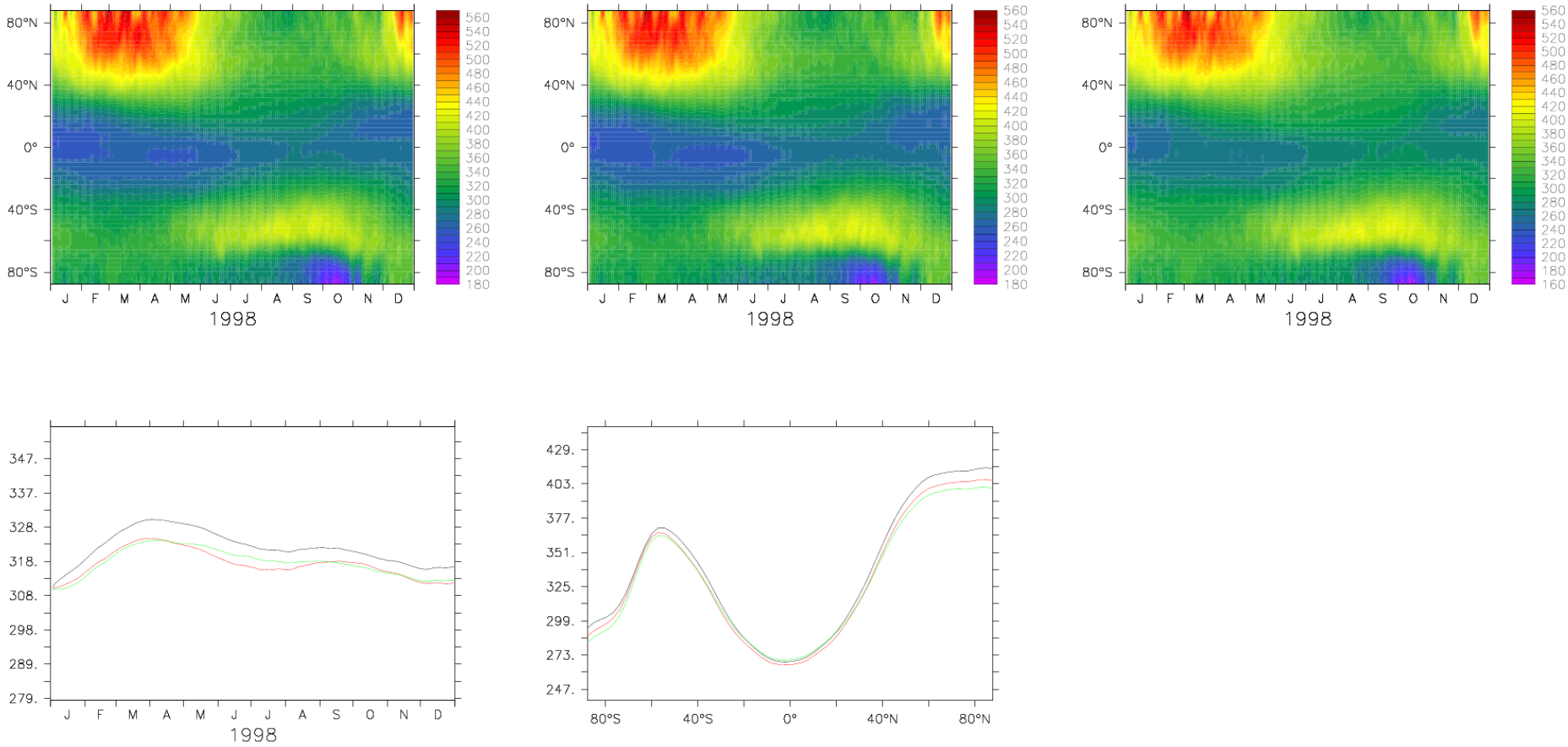

zonal mean O3 at 60S-90S, [ppmv]



## 12 Total column ozone

S-E4CHEM | S-MECCA(E4CHEM) | S-MECCA(EVAL)

zonal mean total column ozone at the surface, DU