

# Supplement of Comprehensive evaluation of iAMAS (v1.0) in simulating Antarctic meteorological fields with observations and reanalysis

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**Table S1.** RMSE (BIAS in parentheses) in 5-15 km temperature for ERA5 and iAMAS. The unit is °C.

Site (Month)	ERA5	U120km	U60km	V16km	V4km
McMurdo (Jan)	0.85 (-0.32)	1.50 (-0.52)	1.40 (-0.43)	1.49 (-0.42)	1.53 (-0.45)
McMurdo (Apr)	1.01 (-0.17)	1.63 (-0.12)	1.54 (0.08)	1.52 (0.06)	1.57 (0.04)
McMurdo (Jul)	0.75 (0.07)	2.06 (-0.44)	1.88 (-0.48)	1.43 (-0.01)	1.35 (-0.09)
McMurdo (Oct)	0.92 (-0.02)	1.57 (-0.17)	1.58 (-0.24)	1.56 (0.27)	1.50 (0.09)
South Pole (Jan)	0.75 (-0.46)	1.59 (-0.82)	1.61 (-0.89)	1.45 (-0.86)	1.38 (-0.80)
South Pole (Apr)	0.71 (-0.09)	1.37 (-0.52)	1.35 (-0.32)	1.40 (-0.18)	1.31 (-0.19)
South Pole (Jul)	0.74 (0.34)	1.44 (-0.38)	1.42 (-0.02)	1.38 (0.13)	1.34 (0.10)
South Pole (Oct)	0.62 (0.04)	1.28 (-0.37)	1.27 (-0.09)	1.31 (0.03)	1.26 (0.09)
Dome C (Jan)	0.61 (-0.25)	1.32 (-0.38)	1.09 (-0.38)	1.05 (-0.40)	1.09 (-0.35)
Dome C (Apr)	0.52 (-0.10)	1.80 (-1.04)	1.47 (-0.83)	1.20 (-0.60)	1.20 (-0.59)
Dome C (Jul)	0.56 (0.10)	1.32 (-0.27)	1.29 (-0.26)	1.21 (-0.19)	1.18 (-0.22)
Dome C (Oct)	0.55 (0.15)	1.43 (-0.32)	1.10 (-0.25)	1.13 (-0.10)	0.95 (-0.05)

**Table S2.** RMSE (BIAS in parentheses) in 15-25 km temperature for ERA5 and iAMAS. The unit is °C. Where "nan" means missing value.

Site (Month)	ERA5	U120km	U60km	V16km	V4km
McMurdo (Jan)	1.24 (-1.05)	1.71 (-1.51)	1.66 (-1.51)	1.76 (-1.61)	1.84 (-1.57)
McMurdo (Apr)	1.12 (-0.64)	2.10 (0.20)	2.21 (0.39)	2.24 (0.35)	2.18 (0.33)
McMurdo (Jul)	nan (nan)	nan (nan)	nan (nan)	nan (nan)	nan (nan)
McMurdo (Oct)	1.28 (0.02)	2.70 (0.00)	2.68 (0.40)	2.62 (-0.08)	2.67 (-0.00)
South Pole (Jan)	0.86 (-0.61)	1.54 (-1.36)	1.57 (-1.38)	1.59 (-1.40)	1.60 (-1.41)
South Pole (Apr)	0.69 (-0.15)	1.40 (0.05)	1.51 (0.15)	1.50 (0.40)	1.52 (0.40)
South Pole (Jul)	0.94 (0.28)	2.71 (-1.85)	2.52 (-1.49)	2.03 (-1.11)	1.76 (-1.09)
South Pole (Oct)	1.36 (-0.43)	3.52 (-2.29)	3.77 (-2.65)	3.57 (-2.33)	3.50 (-2.30)
Dome C (Jan)	0.68 (-0.27)	1.31 (-1.02)	1.30 (-1.03)	1.39 (-1.02)	1.44 (-1.06)
Dome C (Apr)	0.81 (-0.22)	3.32 (-2.45)	3.22 (-2.25)	3.04 (-2.02)	3.10 (-2.16)
Dome C (Jul)	nan (nan)	nan (nan)	nan (nan)	nan (nan)	nan (nan)
Dome C (Oct)	1.32 (-0.76)	11.62 (-8.68)	11.38 (-8.06)	11.09 (-7.71)	11.27 (-7.98)

**Table S3.** RMSE (BIAS in parentheses) in 5-15 km pressure for ERA5 and iAMAS. The unit is hPa.

Site (Month)	ERA5	U120km	U60km	V16km	V4km
McMurdo (Jan)	0.50 (0.28)	1.17 (-0.35)	1.04 (-0.34)	1.08 (-0.26)	1.03 (-0.14)
McMurdo (Apr)	0.55 (0.39)	1.56 (-0.71)	1.30 (-0.50)	0.88 (-0.34)	0.80 (-0.16)
McMurdo (Jul)	0.58 (0.31)	2.99 (-1.27)	3.03 (-1.30)	2.52 (-0.90)	2.38 (-0.71)
McMurdo (Oct)	0.69 (0.51)	1.82 (-0.33)	1.70 (-0.42)	1.37 (-0.26)	1.04 (-0.02)
South Pole (Jan)	0.65 (0.43)	0.63 (-0.09)	0.61 (-0.06)	0.57 (-0.05)	0.60 (-0.04)
South Pole (Apr)	0.88 (0.72)	0.67 (0.03)	0.70 (0.07)	0.79 (0.02)	0.68 (0.03)
South Pole (Jul)	0.95 (0.85)	1.56 (-0.08)	1.33 (0.11)	1.19 (-0.10)	1.20 (-0.12)
South Pole (Oct)	0.72 (0.40)	1.29 (-0.01)	1.58 (-0.01)	1.30 (-0.01)	1.17 (-0.01)
Dome C (Jan)	1.51 (1.37)	1.33 (0.76)	1.11 (0.80)	1.19 (0.88)	1.20 (0.90)
Dome C (Apr)	1.61 (1.62)	1.26 (0.58)	1.13 (0.63)	1.00 (0.65)	1.06 (0.74)
Dome C (Jul)	3.13 (1.73)	3.73 (-0.37)	3.29 (0.38)	3.42 (0.45)	3.29 (0.54)
Dome C (Oct)	1.67 (1.68)	2.12 (1.30)	1.81 (1.30)	1.59 (1.22)	1.44 (1.16)

**Table S4.** RMSE (BIAS in parentheses) in 15-25 km pressure for ERA5 and iAMAS. The unit is hPa. Where "nan" means missing value

Site (Month)	ERA5	U120km	U60km	V16km	V4km
McMurdo (Jan)	0.61 (0.51)	0.39 (-0.38)	0.37 (-0.34)	0.36 (-0.32)	0.34 (-0.30)
McMurdo (Apr)	0.56 (0.36)	0.27 (-0.10)	0.27 (-0.01)	0.29 (-0.01)	0.29 (0.01)
McMurdo (Jul)	nan (nan)	nan (nan)	nan (nan)	nan (nan)	nan (nan)
McMurdo (Oct)	0.71 (0.55)	0.32 (-0.10)	0.31 (-0.07)	0.31 (-0.03)	0.32 (0.01)
South Pole (Jan)	0.58 (0.35)	0.25 (-0.23)	0.25 (-0.22)	0.23 (-0.21)	0.22 (-0.20)
South Pole (Apr)	0.78 (0.57)	0.13 (-0.01)	0.13 (0.05)	0.16 (0.09)	0.16 (0.11)
South Pole (Jul)	0.65 (0.59)	0.23 (-0.21)	0.18 (-0.17)	0.13 (-0.12)	0.11 (-0.09)
South Pole (Oct)	0.68 (0.46)	0.17 (-0.05)	0.16 (-0.04)	0.15 (-0.01)	0.15 (-0.00)
Dome C (Jan)	0.80 (0.55)	0.12 (0.03)	0.11 (0.04)	0.12 (0.05)	0.12 (0.06)
Dome C (Apr)	0.93 (0.70)	0.36 (-0.14)	0.34 (-0.10)	0.32 (-0.05)	0.32 (-0.02)
Dome C (Jul)	nan (nan)	nan (nan)	nan (nan)	nan (nan)	nan (nan)
Dome C (Oct)	0.92 (0.65)	0.50 (-0.33)	0.44 (-0.25)	0.41 (-0.21)	0.40 (-0.21)

**Table S5.** RMSE (BIAS in parentheses) in 5-15 km relative humidity for ERA5 and iAMAS. The unit is g/kg.

Site (Month)	ERA5	U120km	U60km	V16km	V4km
McMurdo (Jan)	0.0408 (0.0050)	0.0484 (0.0022)	0.0480 (0.0021)	0.0567 (0.0032)	0.0550 (0.0032)
McMurdo (Apr)	0.0140 (0.0039)	0.0180 (0.0027)	0.0187 (0.0030)	0.0202 (0.0034)	0.0207 (0.0034)
McMurdo (Jul)	0.0146 (0.0049)	0.0152 (0.0048)	0.0109 (0.0046)	0.0119 (0.0050)	0.0135 (0.0049)
McMurdo (Oct)	0.0161 (0.0042)	0.0204 (0.0040)	0.0193 (0.0037)	0.0194 (0.0039)	0.0202 (0.0041)
South Pole (Jan)	0.0156 (-0.0003)	0.0143 (-0.0005)	0.0170 (-0.0003)	0.0163 (-0.0004)	0.0161 (-0.0004)
South Pole (Apr)	0.0102 (0.0033)	0.0110 (0.0033)	0.0119 (0.0034)	0.0118 (0.0034)	0.0118 (0.0033)
South Pole (Jul)	0.0037 (0.0031)	0.0042 (0.0035)	0.0049 (0.0038)	0.0049 (0.0036)	0.0048 (0.0037)
South Pole (Oct)	0.0050 (0.0029)	0.0055 (0.0033)	0.0064 (0.0034)	0.0062 (0.0033)	0.0062 (0.0033)
Dome C (Jan)	0.0094 (-0.0009)	0.0122 (-0.0008)	0.0108 (-0.0008)	0.0104 (-0.0008)	0.0110 (-0.0007)
Dome C (Apr)	0.0087 (0.0030)	0.0097 (0.0031)	0.0093 (0.0031)	0.0091 (0.0030)	0.0090 (0.0030)
Dome C (Jul)	0.0037 (0.0033)	0.0047 (0.0038)	0.0044 (0.0037)	0.0044 (0.0037)	0.0046 (0.0038)
Dome C (Oct)	0.0033 (0.0025)	0.0045 (0.0032)	0.0043 (0.0032)	0.0040 (0.0031)	0.0040 (0.0030)

**Table S6.** RMSE (BIAS in parentheses) in 15-25 km specific humidity for ERA5 and iAMAS. The unit is g/kg. Where "nan" means missing value

Site (Month)	ERA5	U120km	U60km	V16km	V4km
McMurdo (Jan)	0.0242 (-0.0210)	0.0246 (-0.0211)	0.0246 (-0.0210)	0.0245 (-0.0212)	0.0242 (-0.0210)
McMurdo (Apr)	0.0027 (-0.0004)	0.0028 (-0.0004)	0.0028 (-0.0005)	0.0027 (-0.0002)	0.0027 (-0.0003)
McMurdo (Jul)	nan (nan)	nan (nan)	nan (nan)	nan (nan)	nan (nan)
McMurdo (Oct)	0.0092 (0.0022)	0.0086 (0.0026)	0.0134 (0.0025)	0.0095 (0.0025)	0.0094 (0.0026)
South Pole (Jan)	0.0659 (-0.0497)	0.0652 (-0.0485)	0.0658 (-0.0496)	0.0659 (-0.0497)	0.0659 (-0.0496)
South Pole (Apr)	0.0029 (0.0029)	0.0031 (0.0030)	0.0030 (0.0030)	0.0031 (0.0030)	0.0030 (0.0030)
South Pole (Jul)	0.0026 (0.0023)	0.0026 (0.0002)	0.0027 (0.0000)	0.0027 (0.0003)	0.0026 (0.0004)
South Pole (Oct)	0.0170 (0.0023)	0.0172 (0.0026)	0.0180 (0.0027)	0.0169 (0.0026)	0.0169 (0.0027)
Dome C (Jan)	0.0590 (-0.0439)	0.0592 (-0.0440)	0.0590 (-0.0439)	0.0590 (-0.0438)	0.0590 (-0.0437)
Dome C (Apr)	0.0027 (0.0008)	0.0027 (0.0009)	0.0027 (0.0010)	0.0027 (0.0009)	0.0027 (0.0009)
Dome C (Jul)	nan (nan)	nan (nan)	nan (nan)	nan (nan)	nan (nan)
Dome C (Oct)	0.1127 (-0.0098)	0.1144 (-0.0106)	0.1125 (-0.0104)	0.1122 (-0.0103)	0.1122 (-0.0102)

**Table S7.** RMSE (BIAS in parentheses) in 5-15 km wind speed for ERA5 and iAMAS. The unit is  $\text{m s}^{-1}$ .

Site (Month)	ERA5	U120km	U60km	V16km	V4km
McMurdo (Jan)	1.51 (-0.13)	3.73 (-0.07)	3.71 (-0.01)	3.86 (0.06)	3.76 (0.24)
McMurdo (Apr)	1.72 (-0.09)	4.34 (-1.20)	3.51 (-0.77)	3.33 (-0.43)	3.18 (-0.21)
McMurdo (Jul)	2.32 (-0.08)	4.70 (-0.41)	4.52 (-0.01)	4.49 (-0.35)	4.66 (-0.15)
McMurdo (Oct)	2.32 (-0.08)	5.02 (0.79)	4.74 (0.65)	5.07 (0.20)	4.85 (-0.22)
South Pole (Jan)	1.30 (0.06)	1.79 (-0.24)	1.90 (-0.21)	1.70 (-0.15)	1.78 (-0.11)
South Pole (Apr)	1.70 (0.31)	2.56 (0.53)	2.80 (0.93)	2.86 (0.69)	2.70 (0.82)
South Pole (Jul)	2.02 (-0.39)	6.94 (-0.58)	6.48 (-0.25)	4.57 (-0.25)	4.16 (0.16)
South Pole (Oct)	2.00 (-0.16)	3.87 (-0.41)	3.96 (0.15)	4.11 (-0.13)	3.94 (-0.15)
Dome C (Jan)	1.34 (-0.12)	2.40 (-0.73)	2.02 (-0.39)	1.98 (-0.34)	1.85 (-0.23)
Dome C (Apr)	1.52 (-0.03)	2.92 (-0.88)	2.30 (-0.57)	2.15 (-0.35)	2.19 (-0.18)
Dome C (Jul)	1.53 (-0.27)	5.60 (-1.78)	4.47 (-0.78)	4.66 (-0.45)	4.72 (-0.42)
Dome C (Oct)	1.43 (-0.15)	3.59 (-0.21)	3.39 (0.05)	2.59 (0.07)	2.61 (0.02)

**Table S8.** RMSE (BIAS in parentheses) in 15-25 km wind speed for ERA5 and iAMAS. The unit is  $\text{m s}^{-1}$ . Where "nan" means missing value

Site (Month)	ERA5	U120km	U60km	V16km	V4km
McMurdo (Jan)	1.54 (-0.35)	1.59 (-0.54)	1.64 (-0.55)	1.82 (-0.24)	1.86 (-0.34)
McMurdo (Apr)	2.33 (0.11)	3.14 (0.75)	3.24 (1.25)	3.52 (0.66)	3.27 (0.76)
McMurdo (Jul)	nan (nan)	nan (nan)	nan (nan)	nan (nan)	nan (nan)
McMurdo (Oct)	2.29 (-0.24)	2.64 (0.59)	2.89 (0.97)	2.99 (0.13)	3.10 (0.65)
South Pole (Jan)	1.84 (-0.54)	1.82 (-0.48)	1.84 (-0.35)	1.83 (-0.34)	1.87 (-0.20)
South Pole (Apr)	2.51 (0.08)	6.51 (5.02)	6.80 (5.35)	6.15 (4.79)	6.21 (4.91)
South Pole (Jul)	3.25 (0.69)	3.69 (0.68)	3.85 (1.53)	3.43 (1.12)	3.61 (0.78)
South Pole (Oct)	2.94 (-0.59)	3.60 (0.02)	3.85 (-0.06)	3.78 (-0.22)	3.79 (-0.22)
Dome C (Jan)	1.64 (-0.35)	1.70 (-0.65)	1.71 (-0.53)	1.71 (-0.48)	1.84 (-0.35)
Dome C (Apr)	2.58 (-0.49)	3.82 (-1.58)	3.83 (-1.26)	4.15 (-0.96)	3.93 (-1.28)
Dome C (Jul)	nan (nan)	nan (nan)	nan (nan)	nan (nan)	nan (nan)
Dome C (Oct)	3.65 (-1.20)	8.24 (-5.59)	8.07 (-3.99)	9.46 (-4.49)	8.18 (-4.04)