



Supplement of

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

Qike Yang et al.

Correspondence to: Chun Zhao (chunzhao@ustc.edu.cn)

The copyright of individual parts of the supplement might differ from the article licence.

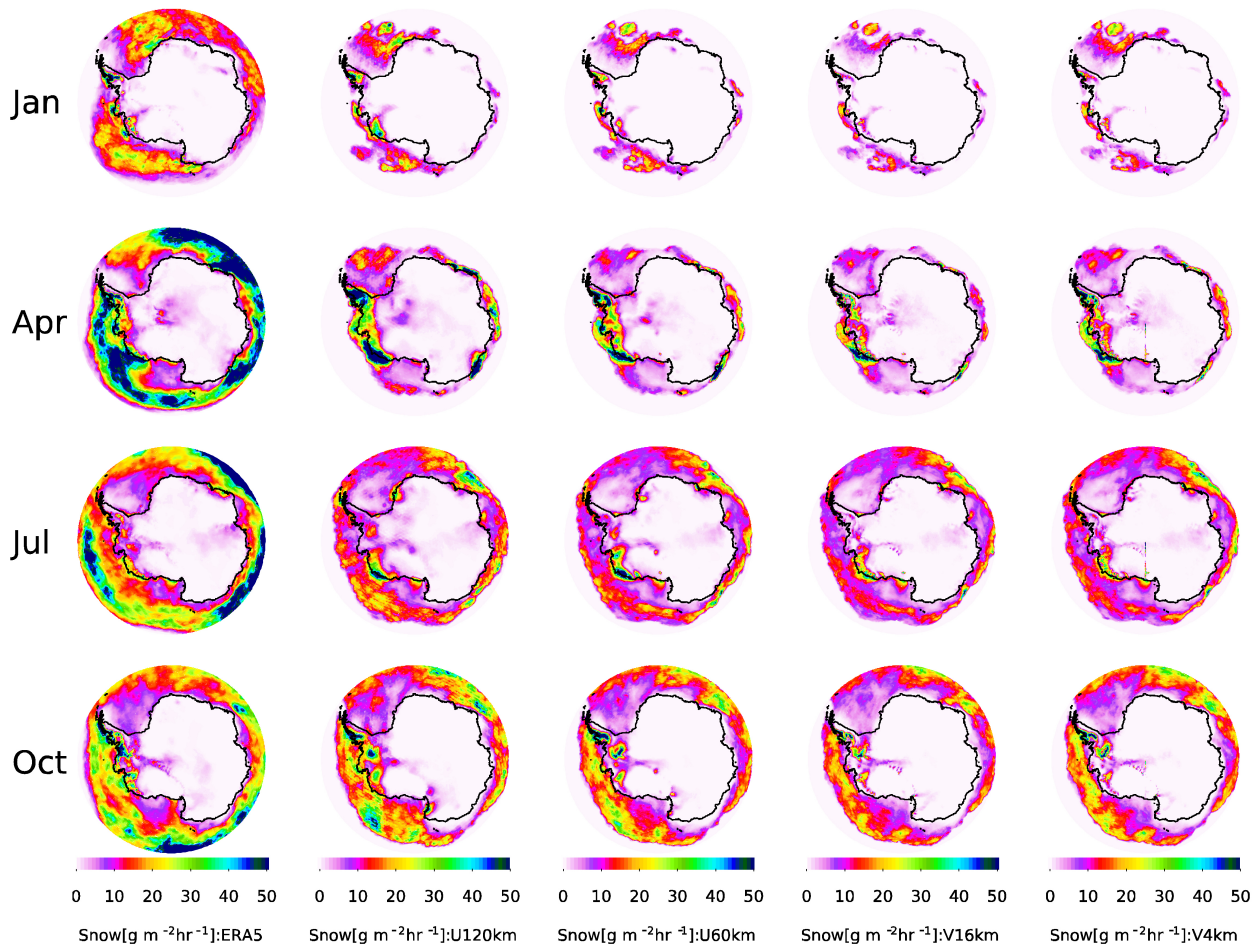


Figure S1. The first column displays the monthly median snowfall ($\text{Snow}[\text{g m}^{-2} \text{ hour}^{-1}]$) from ERA5. The four rightmost columns show the monthly median values of snowfall ($\text{Snow}[\text{g m}^{-2} \text{ hour}^{-1}]$) from iAMAS with four mesh resolutions.

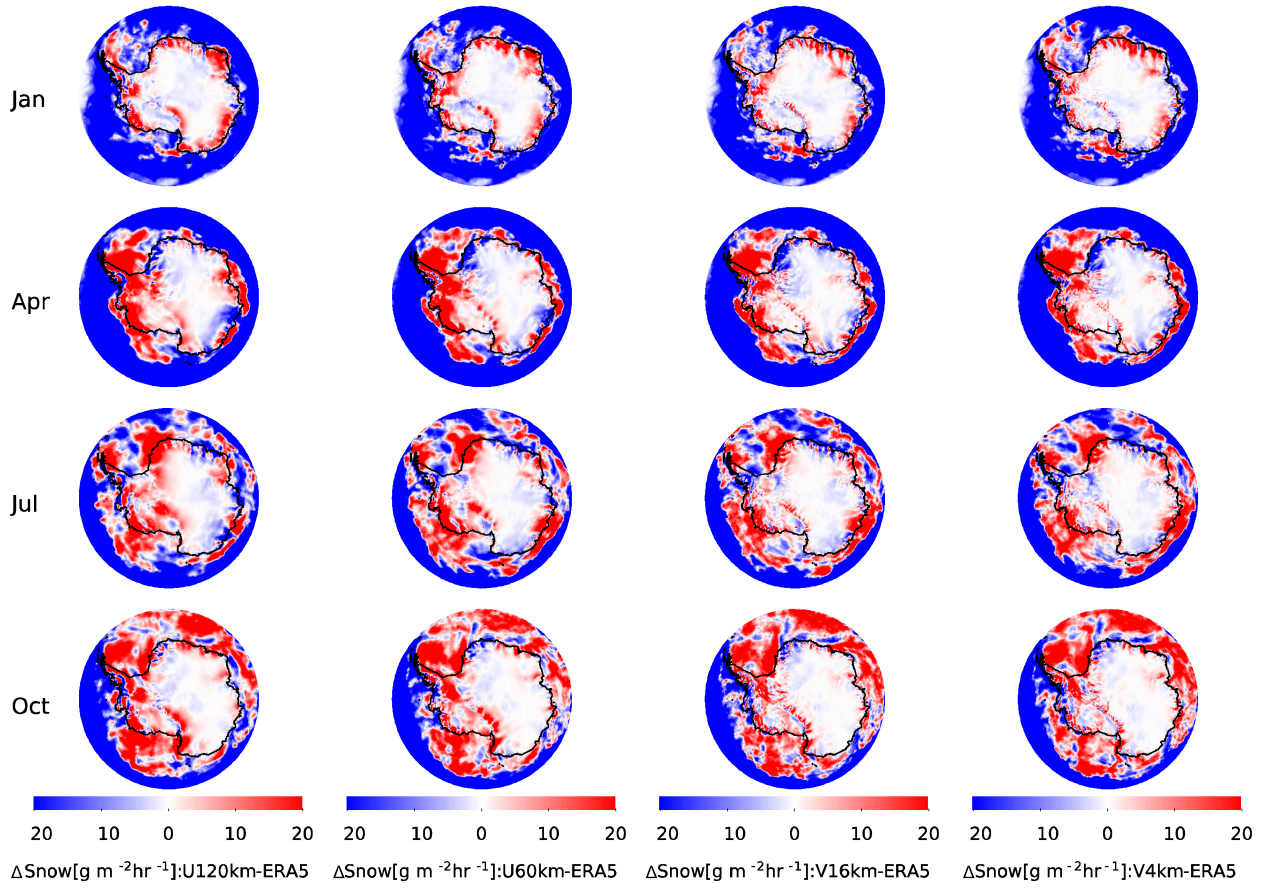


Figure S2. Monthly mean values of snowfall biases ($\Delta\text{Snow}[\text{g m}^{-2} \text{ hour}^{-1}]$) for iAMAS minus ERA5. The mean values were used instead of the median values because there are many zero values in the snowfall datasets.

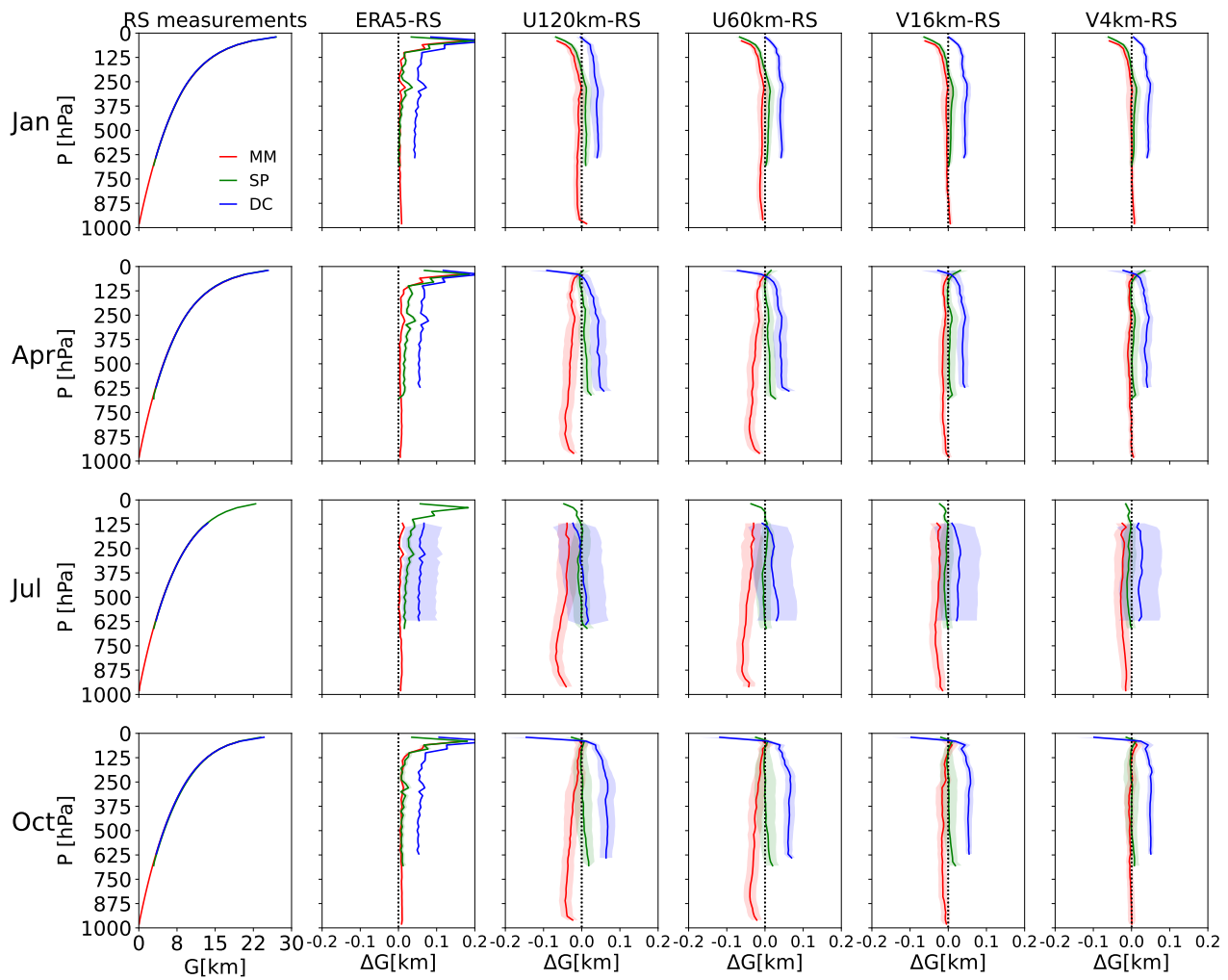


Figure S3. The first column displays the monthly medians of radiosonde-measured geopotential height (G [km]) profiles. The five rightmost columns show the monthly median geopotential height biases (ΔG [km]) for ERA5 and iAMAS (U120km, U60km, V16km, and V4km) compared to radiosonde measurements. The shading represents the standard error.

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^{-1} .

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^{-1} . 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 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 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)

Table S9. Monthly RMSE (BIAS in parentheses) of the 500-hPa geopotential height (m) for ERA5 and iAMAS compared with radiosondes.

Site (Month)	ERA5	U120km	U60km	V16km	V4km
McMurdo (Jan)	5.2 (4.2)	24.1 (-6.7)	21.7 (-7.8)	19.3 (-3.2)	16.9 (-0.4)
McMurdo (Apr)	5.6 (3.6)	49.4 (-31.3)	42.1 (-30.5)	26.2 (-14.8)	24.6 (-7.7)
McMurdo (Jul)	7.3 (3.3)	67.6 (-41.6)	66.7 (-45.5)	53.3 (-26.2)	49.9 (-27.8)
McMurdo (Oct)	7.5 (4.7)	43.8 (-29.0)	44.0 (-26.5)	31.8 (-13.9)	22.4 (-5.4)
South Pole (Jan)	8.7 (2.0)	28.5 (11.5)	22.9 (8.5)	20.6 (6.7)	20.9 (5.7)
South Pole (Apr)	17.2 (13.0)	29.7 (13.2)	32.9 (12.5)	33.1 (2.7)	28.2 (1.1)
South Pole (Jul)	17.1 (14.5)	48.8 (-2.0)	39.9 (-4.6)	32.4 (-8.8)	31.1 (-11.1)
South Pole (Oct)	15.7 (6.9)	41.2 (6.6)	46.1 (5.7)	34.4 (2.7)	28.9 (0.2)
Dome C (Jan)	41.3 (41.4)	54.7 (41.9)	48.9 (41.8)	50.4 (44.0)	49.4 (42.9)
Dome C (Apr)	52.8 (52.4)	68.8 (46.7)	58.2 (43.7)	49.8 (39.3)	51.6 (39.9)
Dome C (Jul)	97.3 (50.9)	105.3 (12.2)	101.1 (30.9)	103.5 (25.4)	102.0 (20.2)
Dome C (Oct)	49.9 (49.1)	78.6 (67.6)	66.9 (61.5)	56.5 (52.7)	53.2 (49.9)