

The Implications of Climate Change on Antarctic International Relations

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Current Climate

Table 1. Climate summaries for two sample locations. South Pole (Lazzara et al., 2012) and Lindsey Island AWS (Choi et al., in review)

Variable	South Pole Station (USA)	Lindsey Island AWS (South Korea)
Temperature	Minimum: -82.8 °C (-117.0°F) Maximum: -12.3 °C (9.9°F)	Minimum: -24.8°C (-12.64°F) Maximum: -0.3°C (31.46°F)
Pressure	Minimum: 660 hPa (19.50 inHg) Maximum: 719 hPa (21.20 inHg)	Minimum: 960.7hPa (28.40 inHg) Maximum: 993.9hPa (29.30 inHg)
Wind Speed	Summer: 2 ms ⁻¹ (4.5mph) Spring, Autumn, & early and late Winter: 4.5 ms ⁻¹ (10mph)	Average : 9.2ms ⁻¹ (20.6mph) Maximum: 44.9 ms ⁻¹ (100.4mph)
Albedo	Year round: 0.7 - ~0.9	Summer: 0.3 - ~0.4 Spring: 0.5 - ~0.6 Autumn: 0.5 - ~0.7

Future Climate

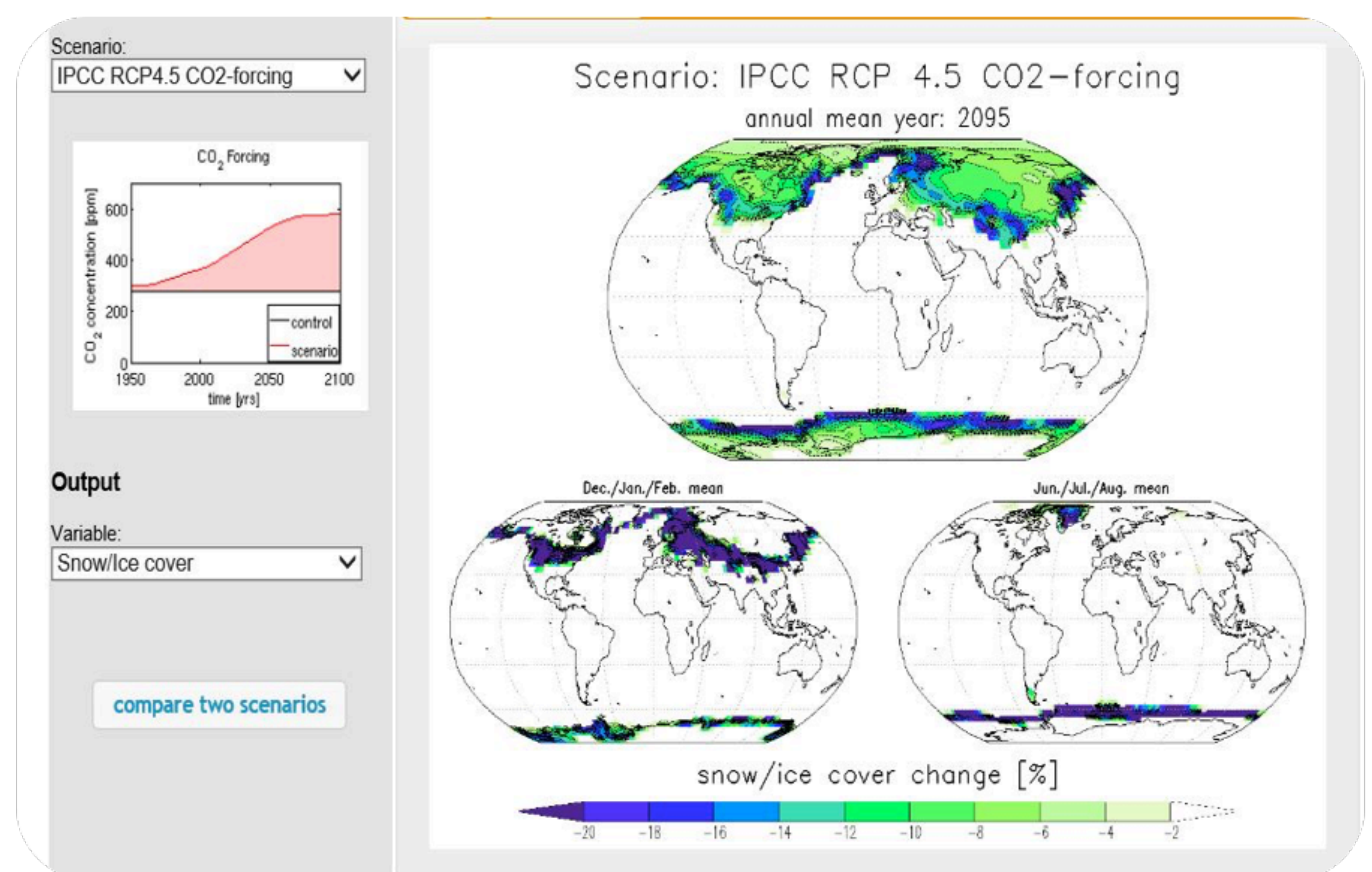


Figure 1. A sample output display of snow and ice cover change from the Monash University simple climate model driven with the IPCC RCP4.5 CO2 forcing.

International Relations

Antarctic Treaty stipulations:

- Freedom of scientific investigation
- Cooperation among countries
- Exchange of scientific observation results among nations

Further regulations have been added to protect the Antarctic environment via the Madrid Protocol. In addition, the International Whaling Commission has been imposing regulations to stop countries that are excessively hunting whales.

Melting sea ice and warming temperatures are allowing countries and organizations increased access to Antarctica (including tourism). There are many countries that are coming to establish their scientific research and expand new stations and routes.

Antarctic Expansion

Russia

- First Orthodox Church in Antarctica on a hill → Monitoring stations
- Scientific observations
- Russian Navy with an ambition to have economic benefits and obtain potential resources

China

- One new station (5)
- Fastest country that is researching on Antarctica

United States

- Rebuilding the station by McMurdo Station

South Korea

- Built the second station; Jang Bogo station
- Testing robots developed by Korean researchers for an extremely cold weather in Antarctica
- Subglacial Lake near the planned Third station
- Korean Route (about 350 miles long)

India

New Bharathi base

Turkey & Iran

Picture by Julie M. Rodriguez

Examples: Tourism & Whaling

International Whaling Commission

- Providing protection of certain species
- Designating whale sanctuaries
- Limiting the number & size of the whales harvested

Two Sanctuaries

- **The Indian Ocean:** Established in 1979 in for ten years & extended three times since!
- **The Southern Ocean:** Established in 1994 & extended in 2004
- Many countries are still hunting...

Rise in Tourism (courtesy IAATO):

Land-based: 757% in last 10 years

Ship-based: 140% in last 14 years

Tourists: 2,500 in 1990-1991 & 37,000 in 2006-2007

The Uncertain Future

- ✓ After 2048, will the Antarctic Treaty Environmental regulations continue?
- ✓ Will renewable resources reduce CO₂ and thus, less Antarctic change?
- ✓ Will there be competition over Antarctic resources?
- ✓ Could relations among countries be impacted in the future?

Acknowledgements

Lazzara, M. A., L. M. Keller, T. Markle, and J. Gallagher, 2012: Fifty-year Amundsen-Scott South Pole station surface climatology. *Atmos. Res.*, **118**, 240-259. doi: 10.1016/j.atmosres.2012.06.027

Choi, T., S.J. Kim, J.H. Kim, and M.A. Lazzara, 2016: Characteristics of surface meteorology at Lindsey Island, Amundsen Sea, West Antarctica from 2008 to 2014, *J. Geophysical Research*, in review.

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