

Antarctica, pancakes and cyclones

Antarctica's role in climate change

Antarctica is a land continent surrounded by a vast field of frozen sea water, known as *sea ice*. The total area (or extent) of sea ice is highly seasonal, with it increasing almost 10-fold to approximately the size of Russia over the winter months. Due to its light colour, sea ice cools the Earth by reflecting (most of) the solar radiation that the dark open ocean it conceals would absorb. This creates a feedback loop where a lack of sea ice will promote greater losses in the future, and hence is critical for predicting the future of climate change.

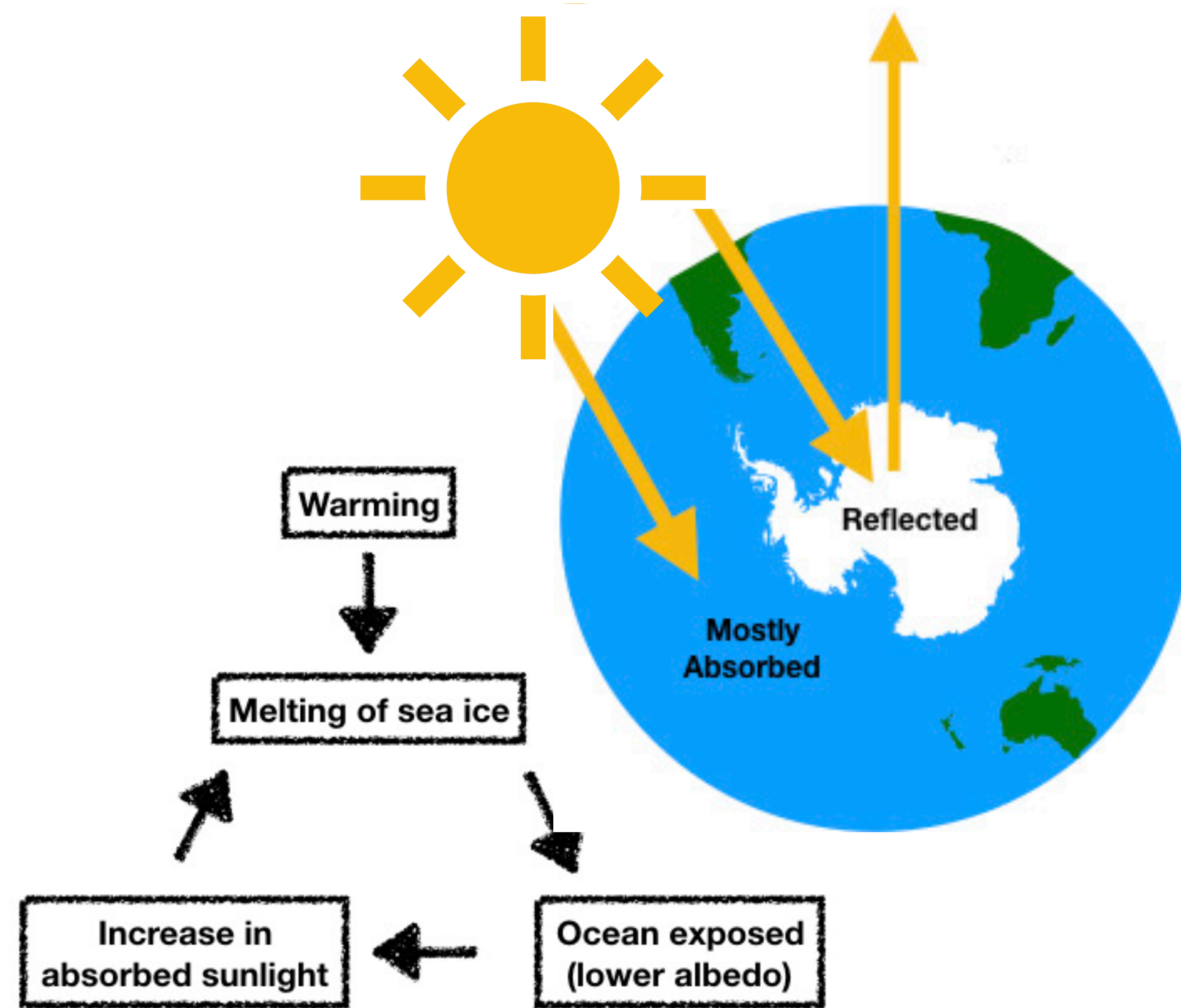


Fig. Sea ice is connected to the climate through the 'albedo feedback mechanism'.

Pancake ice

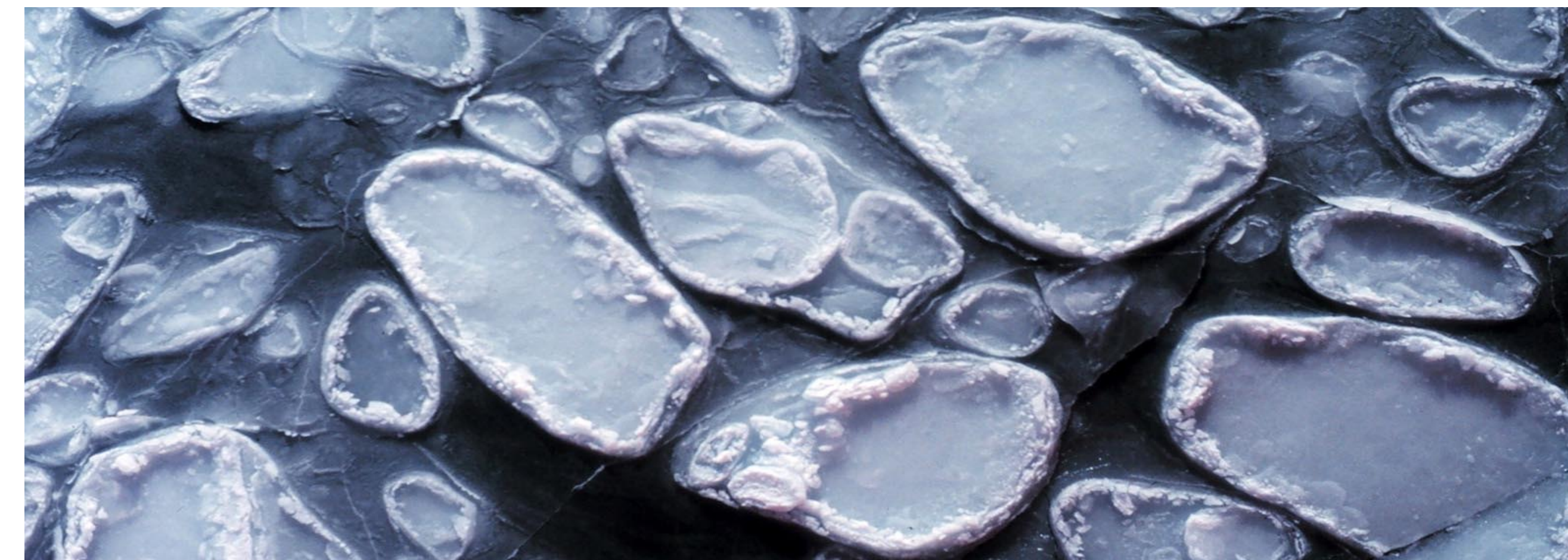


Fig. Pancake ice is relatively small (~1 m wide), round with raised rims and is prevalent in the winter Antarctic sea ice cover (Shields, HowStuffWorks, 2021).

The outer band of sea ice around Antarctica is inundated with large ocean (> 14 m). During winter, these waves promote the formation of small round chunks of sea ice - which look like large pancakes - while breaking up larger pieces of ice, therefore increasing the surface area of the ice and making them more likely to melt.

Cyclones

Polar cyclones are a common occurrence around Antarctica and have been recently found to push large amounts pancake ice hundreds of kilometres over only a couple of days. This phenomena leads to increased variability in measurements of total sea ice area as the boundary of the sea ice can be moved north or south depending on the direction of the winds. From our simulations, in a single hour winds can move up to 50 km² of sea ice (50%), which agrees with the observations taken from the same time.

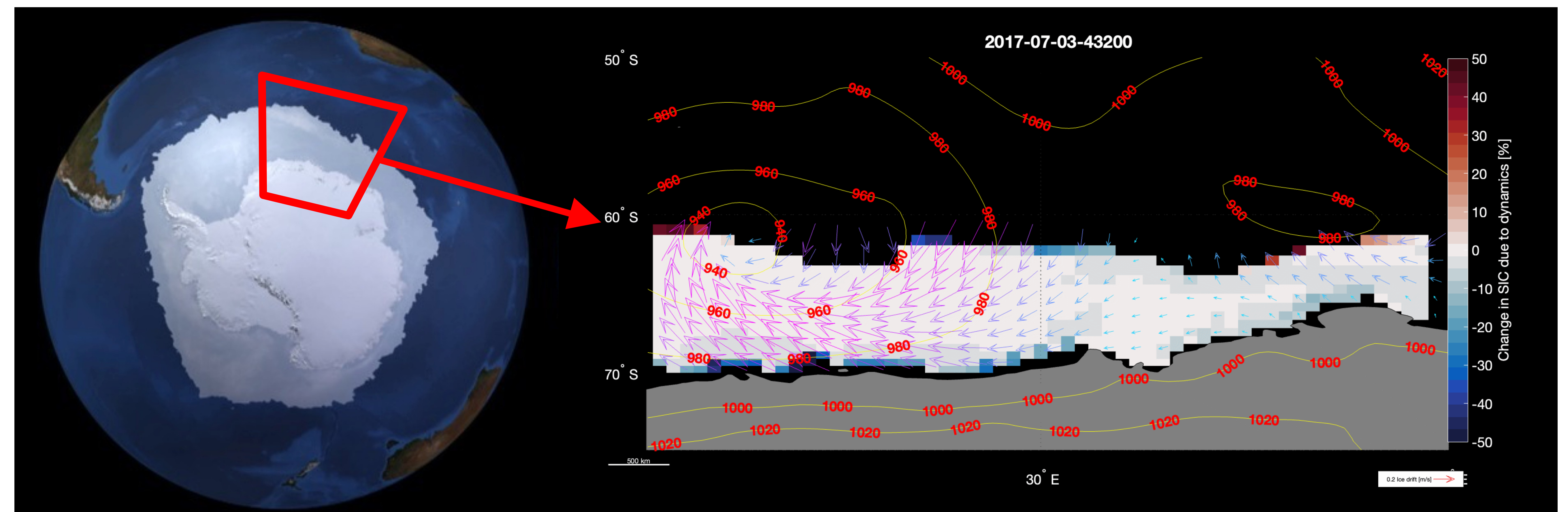


Fig. Map of Antarctica sea ice (left; Nasa, 2019). Simulated impacts of a cyclone on the sea ice concentration (SIC) using a mathematical model (right).