





Introduction

Overall, Arctic sea ice is declining and Antarctic sea ice has a near-zero trend over the past 40+ years. However, there are distinct regional variations in these trends. Regional masks were developed to investigate these trends, but the masks were created in a non-rigorous fashion for defined grids at low spatial resolution; and there are inconsistencies in masks, even within products at NSIDC. Here we present an improved, more accurate regional mask based on accepted standards.

Key features of new region mask

- Based off of International Hydrographic Office (IHO) definitions of seas – modified for use with sea ice, e.g.:
- Beaufort Sea northern border at 76° N latitude, at southwest coast of St. Patrick Island
- Beaufort Sea northern border extends west at constant latitude instead of diagonally across to Point Barrow as in IHO definition
- Regions defined initially as latitude/longitude vertices and mapped into GIS shapefiles
- Uses lines of constant latitude and longitude where reasonable
- Consistent, documented rules for connecting vertices and mapping shapefile onto grids
- Flexible to facilitate gridded to different projections, spatial resolutions
- Region shapefile polygons drawn to overlap land to allow use of different land masks
- Consistency with previous region mask retained where it makes sense
- New regions added for greater flexibility and broader applications
- Gulf of Alaska, Gulf of Bothnia, Bohai Sea, Sea of Japan



A new regional mask for Arctic sea ice trends and climatologies

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New 2021 Arctic region mask

History of old region masks



Modified NSIDC mask

- Uses Goddard mask as its foundation
- Subdivides some Goddard regions into new regions
- Separate Kara and Barents
- Arctic Ocean split into Beaufort, Chukchi, East Siberia, Laptev (coastal seas)
- Northern boundary of coastal seas are arbitrary, drawn as straight lines in the projection
- Other regions and boundaries same as Goddard mask
- Meier et al., Ann. Glaciol., 2007



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Original NASA Goddard mask

- Derived in mid-1980s by researchers at NASA Goddard
- Modified in mid-1990s
- Derived on 25 km polar stereographic grid
- Based on accepted general definitions, but boundaries are not exact
- No coastal sea regions within Arctic Ocean
- Combined Kara/Barents Sea region
- Parkinson et al., JGR, 1999



MASIE mask

- Derived to support NSIDC Multisensor Analyzed Sea Ice Extent (MASIE) product
- Used NSIDC mask as basis, but regions drawn independently
- Regions created as shapefiles manually drawn in GIS using straight lines on projection
- Baltic Sea, Bohai Sea, and Gulf of Alaska regions added
- Baffin and Gulf of St. Lawrence merged into one region
- Fetterer et al., 2010; NSIDC





