

ARC30 workflow

1 Prepare masks for season and ice types

GCM
Sea ice thickness
Snow thickness
Surface temperature

Processing for each point

Mask for seasons

Melting snow, bare summer ice, cold conditions

Mask for ice types

First-year ice, multiyear ice

2 Prepare sea ice profiles for cold conditions

GCM
Sea ice thickness
Snow thickness
Surface temperature

Masks (ice types and seasons)

Processing for cold conditions points

Snow-covered ice profiles

Layer temperature, salinity, thickness, wetness, density, correlation length, snow/first-year/multiyear ice

Bare ice profiles

Layer temperature, salinity, thickness, wetness, density, correlation length, first-year/multiyear ice

3 Compute sea ice surface brightness temperature for cold conditions

Snow-covered ice profiles

MEMLS

Snow-covered ice brightness temperature

$x_{\text{snow-cover}}$ fraction

Bare ice profiles

MEMLS

Bare ice brightness temperature

Cold conditions ice brightness temperature

x_{bare} fraction

4 Compute sea ice surface brightness temperature for all conditions

Cold conditions ice brightness temperature

Masks (seasons)

Processing for each point

Ice brightness temperature

Cold conditions: cold conditions ice brightness temperatures

Melting snow: snow surface temperature

Summer bare ice: constant inferred from observations (266.78 K)

5 Add sea ice concentration and atmospheric effect

GCM

Sea ice concentration
Melt pond fraction
Snow ice column surface temperature
Sea surface temperature
Atmospheric columnar liquid water and water vapor

Simple ocean emission and atmospheric radiative transfer model (Wentz and Meissner, 2000)

Brightness temperature at top of atmosphere

Ice brightness temperature