Exercise 29.Okt:

1. Components: Snow, Glacier, Land ice, Shelf ice, Sea ice
2. Sea ice extent: Complete area within the ice edge

Sea ice area: Considers ice free areas within the ice edge

 Observed by Satellite, Ship, Airplane, Buoy

1. Carbon cycle: Chemical processes (e.g. Calcium Carbonate crystals that form in winter months) more effective as removing CO2 from atmosphere than biological processes.

Melting of sea ice enhances CO2 – absorption atmosphere. Ice drift leads to carbon redistribution.

1. Mercury sink: Rising temperature 🡪unfreezing permafrost and glacier🡪release of mercury

“Bromide-Explosion”, Bromide makes mercury more reactive

1. Sea ice extent area in 10^6 km: Arctic, Min (Sep) 5 to 6,5 Max (Mar) 14 to 15

Antarctic: Min (Feb) 2 to 3 Max (Sep) 16 to 19



1. Ice zones: marginal ice zone: Dominated by open ocean processes.

Shear ice zones: Shear deformation has been concentrated.

Exercise 05.Nov:

1. See exercise 29.Okt - 5)
2. Sea ice terminology: Marginal ice zone: Dominated by open ocean processes. Fast ice: Sea ice that has frozen along the coast, little movement. Perennial ice: Multiyear ice. Lead: Passage through the sea ice that is too wide to jump across. Polynya: Opening enclosed in ice (See exercise 26.Nov.
3. Isostatic equilibrium:

First year: , Muti Year:

1. Latent heat of fusion: a) 🡪 = 330 J/g\*1000g = 330 KJ

b)

 5) Sea ice growth: With constant energy flux FL, ice thickness after 24 hours.

 Thickness of the end of the day🡪

1. Deposition of salts from sea water by frigid concentration: Precipitation of Na2SO4 at T<-8.2° leads to removal of sulfate from the solution.

Exercise 19.Nov.

1. Energy imbalance: , F=Energy Flux, h=Sea Ice Growth
2. Radiative fluxes: Wavelength bands a) Solar radiation (incoming), earth radiation (outgoing)
3. Earths radiative energy budget: Jan 351 W/m² , Jun 330 W/m² Maximum: 40°N and > 75°N (North pole)
4. Radiative energy balance: ,
5. Thermal emission: ,

Emissivity cloud cover: , C=Cloud Cover (Clear Sky C=0)

Exercise 26.Nov.

**Polynyas:** - costal: formed by coastal winds

 -open-ocean: upwelling of warm water (convection)

**Where?** -often in relation to fast ice

|  |  |
| --- | --- |
| **Open-ocean** | **Coastal** |
| Weddell Sea | St. Lawrence Island |

**Ice produced per season**: Arctic: about 5m, Antarctic: about 10m

**Sediment transport:** sediment incorporated in frazil ice 🡪 transport to open ocean

Upwelling of sediments by: river deltas, strong winds, tidal movement

**Biological Importance:** high primary production in summer 🡪feeding place, breathing holes for mammals 🡪 important for survival in winter

**Influence of the ocean:** large heat souce, forming large amount of ice, freeing salt 🡪 creates a barrier to protect ice from warm Atlantic water.

**Size of Polynyas based on a Balance of:** temperature, wind speed



Exercise 03.Dez

1. Major arctic water layers:
2. Equilibrium sea ice thickness and oceanic heat flux:

 , , k=thermal conductivity , F=heat flux , H=height

 ,

Typical ocean heat fluxes: Arctic , Antarctic