

Sea ice in the Climate System

Lars Kaleschke

Institute of Oceanography, Center for Marine and Atmospheric Research, Hamburg

lars.kaleschke@zmaw.de
ZMAW room 142, Tel. 6518

22. Oct. 2008

Overview

Part 1 - Wintersemester 2008/2009

- Sea ice physics
- Interaction with the ocean and the atmosphere
- Observation of sea ice

Part 2 - Sommersemester 2009

- Paleoclimate
- Sea ice modeling
- Future scenarios

Structure

- Lecture
- Exercises
- Exam
- Project
- 2 SWS, 3 LP

Overview Wintersemester 2008/2009

- 1 22.10. Nomenclature, technical terms
- 2 29.10. Phase diagram
- 3 5.11. Growth and vertical structure
- 4 12.11. Mechanics
- 5 19.11. Climatology
- 6 26.11. Surface heat balance
- 7 3.12. Interaction with the atmosphere
- 8 10.12. Interaction with the ocean
- 9 17.12. Electromagnetic properties
- 10 7.1. Remote sensing: sea ice type and concentration
- 11 14.1. Remote sensing: sea ice drift
- 12 21.1. Remote sensing: sea ice thickness
- 13 28.1. Exam
- 14 4.2. Evaluation

Guests

- Gerhard Dieckmann (AWI): Ikaite in sea ice
31. Oct 9:00 Geom. H3
- Bruno Tremblay (Canada): Sea ice decline
4. Nov 10:15 ZMAW 133, 15:15 ZMAW 22/23
- Eckhard Kleine (BSH): Sea ice mechanics
11. Nov 15:15 ZMAW 22/23

Questions about talks may occur in exam

Nomenclature/technical terms

- It is important to speak the same “language”
- Well defined terms reduce potential for misinterpretation
 - Origin: precipitation (glaciers, land ice) or frozen ocean (sea ice)
- Technical terms may not be well suited for public outreach, e.g. ice extent (Eis Ausdehnung)

Stages of ice development: New ice in Langmuir rolls



Frazil ice/grease ice: plates of ice suspended in water, coagulated to form a soupy layer.

Stages of ice development: New ice with frost flowers



Courtesy of S. Kern

Frost flowers: Salty ice crystals that grow on nilas under cold conditions

Stages of ice development: Pancake ice



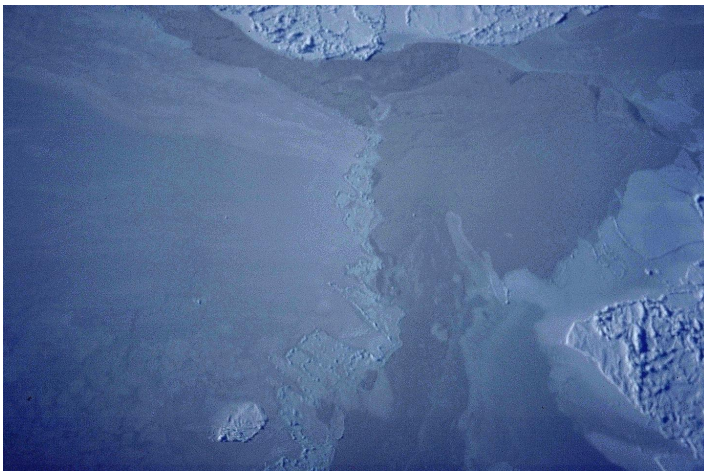
Pancake ice: Predominantly circular pieces formed in the presence of waves

Stages of ice development: Pancake ice



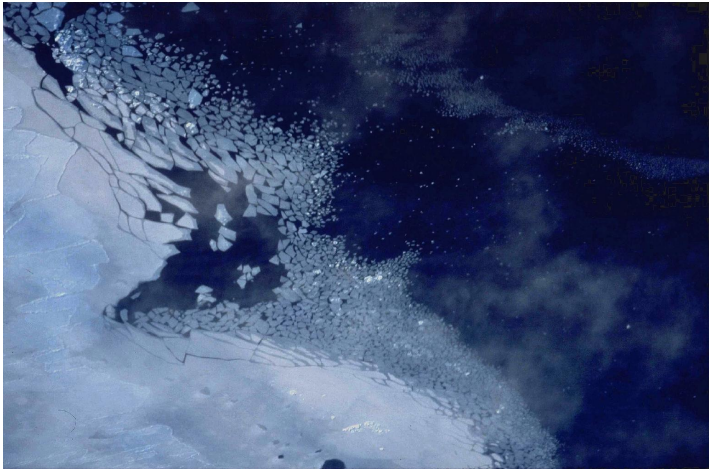
Pancake ice: Predominantly circular pieces formed in the presence of waves

Stages of ice development: Young ice



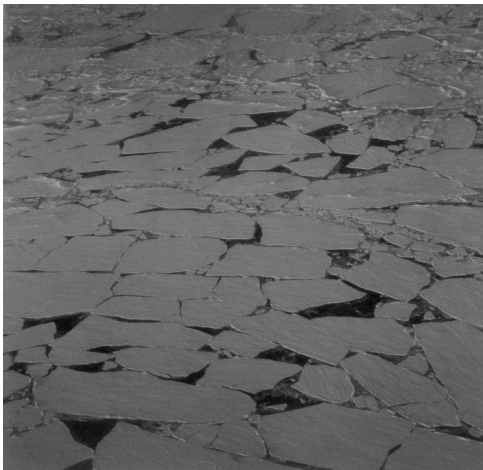
Young ice: In the transition stage between *nilas* and *first-year ice* (10-30 cm)

Stages of ice development: Young ice



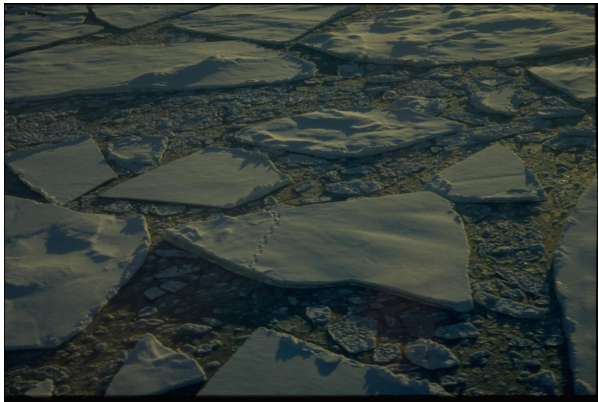
Young ice: May be subdivided into grey ice and grey-white ice

Stages of ice development: First year ice



First year ice: Sea ice of not more than one winter's growth (30 cm - 2 m)

Stages of ice development: Old ice



Old ice: Sea ice which has survived at least one summer's melt. Topographic features are smoother than on first year ice.