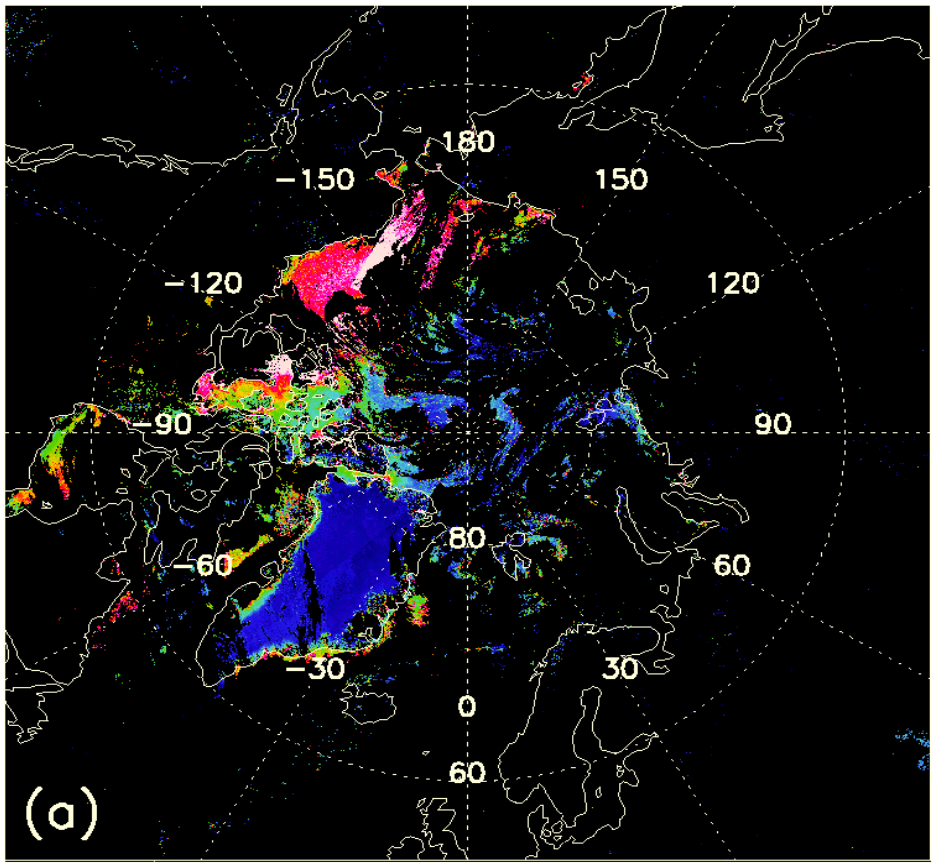
Cryosphere Group Report

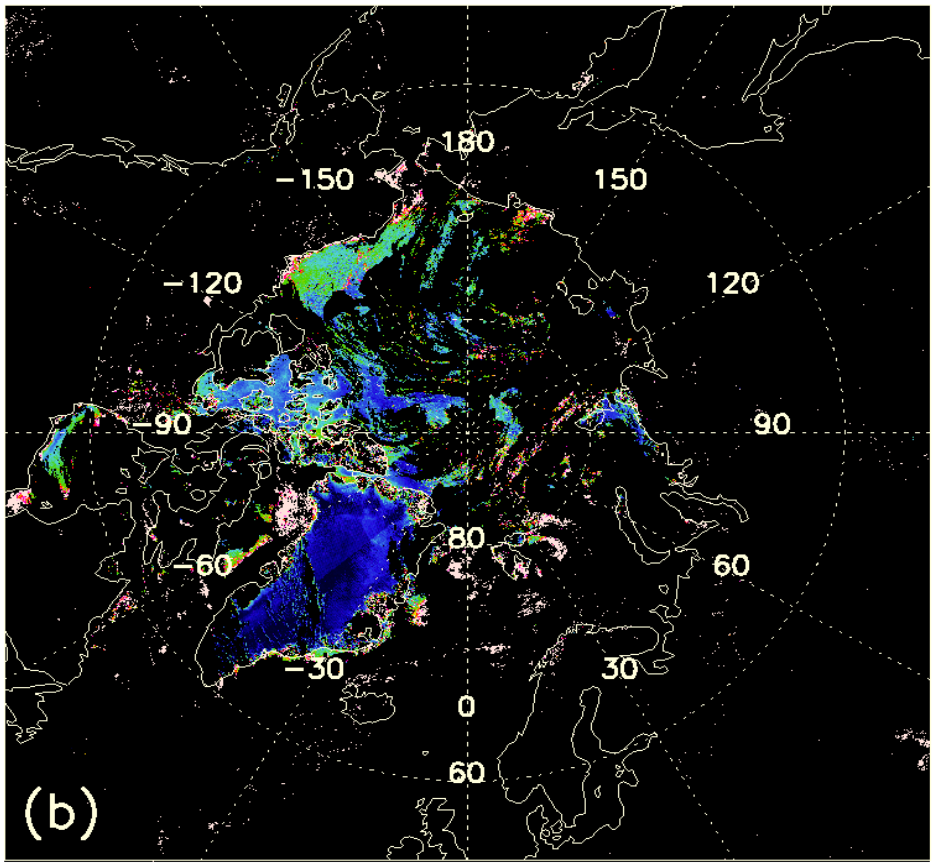
1. "Algorithm performance tests for the future developments" by Masahiro Hori (EORC / NASDA)
2. "Improvement of snow BRDF model using non-spherical ice particles" by Teruo Aoki (MRI)
3. "Retrieval of snow grain size and impurity from GLI: Atmospheric correction" by Knut Stamnes (Stevens Institute of Technology)
4. Joint field experiment in Hokkaido, Japan in 2002 with US scientists.

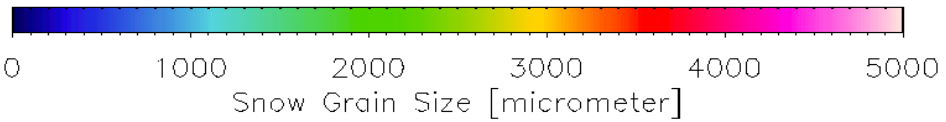
Retrieved snow grain size and impurities from one-day-data

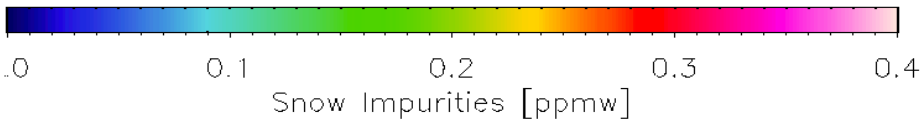
Snow grain size

Mass fraction of snow impurities







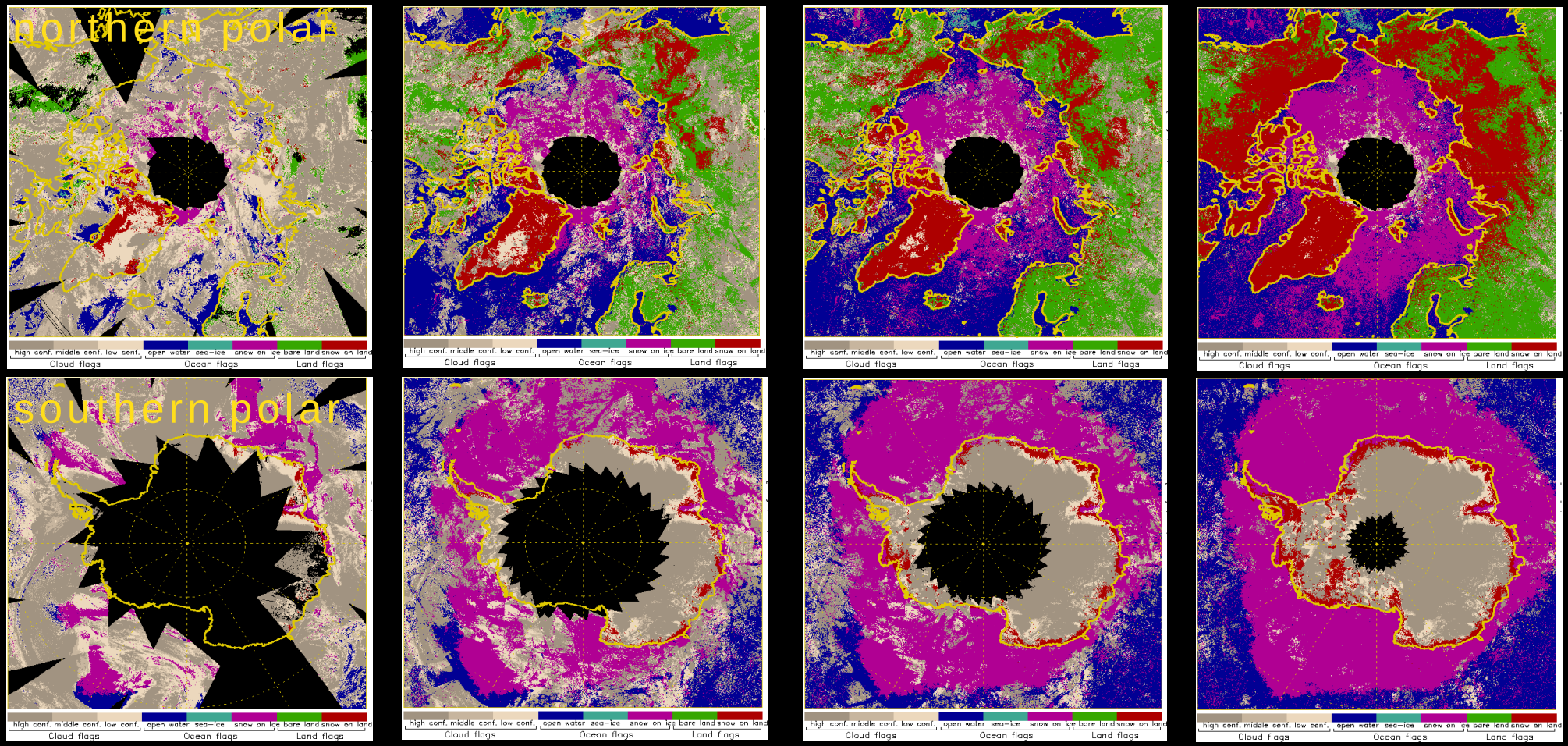


How many days are necessary for cloud screening ?

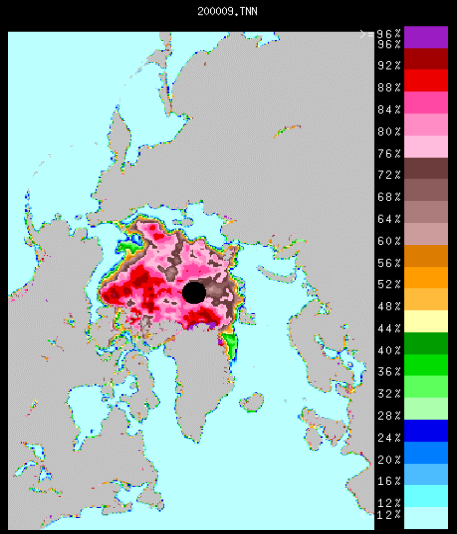
Data period : Sep. 13 ~ Oct. 12, 2000

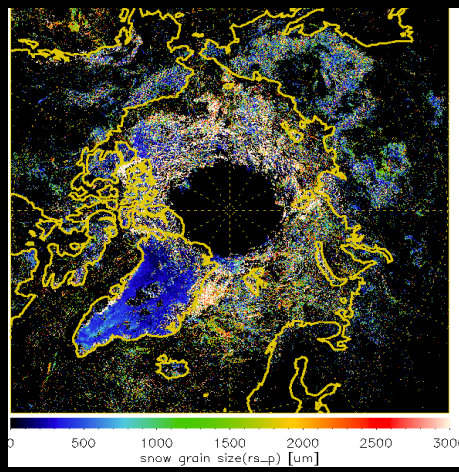
Cloud detection method : brightness temp. difference (3.7 μm－11 μm)
reflectance of 1.38 μm

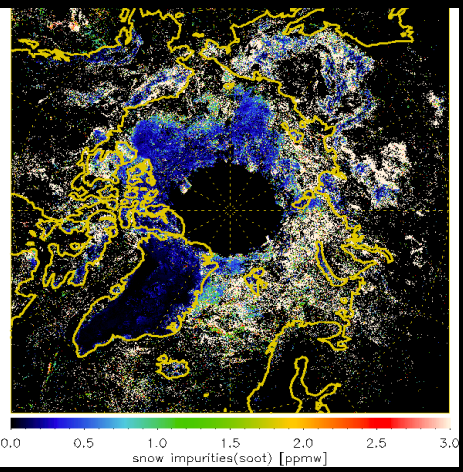
1day → 1week → 2weeks → 1month

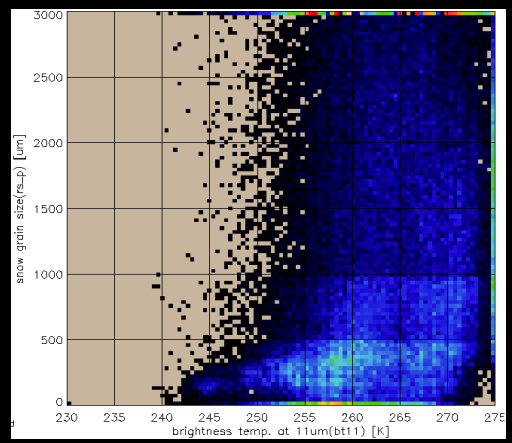


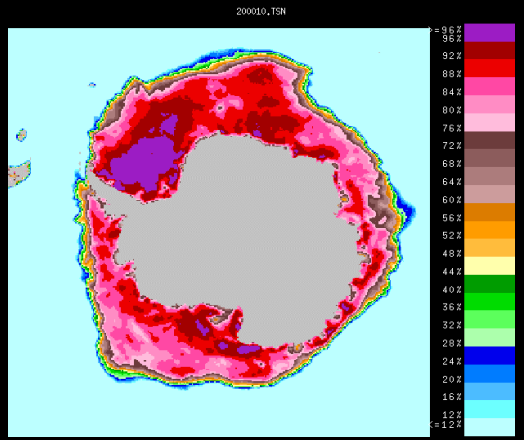
Retrieved snow grain size and impurities from 2weeks data (upper:Sep.13–26, lower:Sep.27–Oct.11)

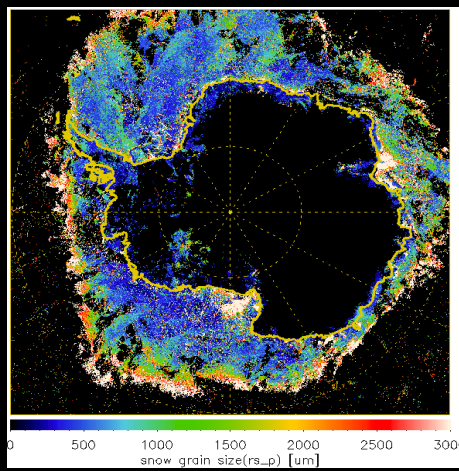


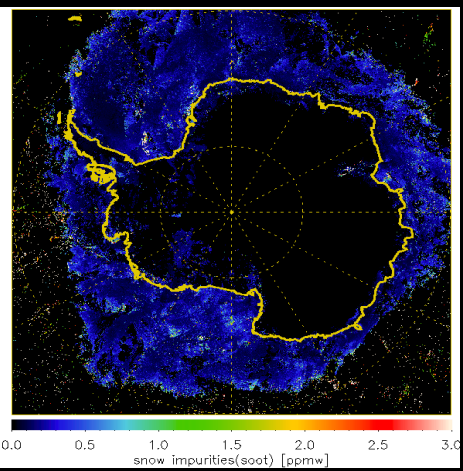


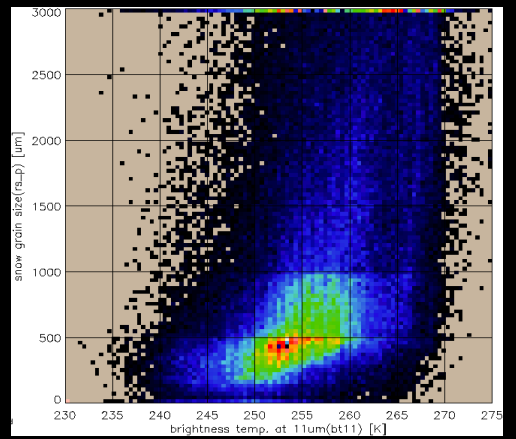












Sea-Ice conc.(SSM/I) **Snow grain size** **Snow impurities** **BT_{11}vs.Snow grain size**

Summary (1)

1. Consideration items from algorithm performance tests

- Is the expansion of value ranges of snow parameter defined in the lookup tables (CTSK2b1) necessary for global application ?

  → For snow grain size retrieval more wide range is helpful.

- Evaluation of the effects of sub-pixel contamination by non-snow pixels such as clouds, forest, melting pond and open ocean on the accuracy of the retrieved snow parameters

  → Contaminations by melting pond, open ocean or cloud in the Arctic sea and those by vegetation at low altitude land area should be examined using high spatial resolution data

- Cloud detection over Antarctica does not work well

  →Discrimination parameters should be checked.

- Evaluation of the effect of surface roughness on the retrieval of snow parameters in real snow fields

  → To be investigated.

Summary (2)

2. Snow BRDF test using non-spherical ice particles

- Hexagonal column is the best model for dendrites snow BRDF in oblate, prolate, hexagonal column, hexagonal plate and sphere.
- For the other snow types, similar test should be made.

→Three typical snow types as dendrites, faceted crystal and granular snow are considered and corresponded to three size ranges (small, medium and large), respectively.

- Effect of crystal surface roughness on phase function is similar to the complicated crystal shape.Investigation of non-spherical particles for different types of snow crystals

→Validation of BRDF model for the crystal having rough surface with the field data (BRDF and micrograph of crystal surface)

Summary (3)

3. Evaluation of the validity of the atmospheric and aerosol models in CTSK2b1 for atmospheric correction

- We have reviewed the snow grain size and retrieval algorithm with an emphasis on atmospheric correction issues.
- It has been tested against synthetic data and appears to be robust. Application to MODIS data yields reasonable results.
- Testing against field data is necessary when GLI data become available.
- These algorithms can be used to provide:

Cloud mask

Snow grain size and impurites

Aerosol optical properties

Spectral albedo

Joint field experiment at Saroma, Hokkaido in 2002

Place: Saroma lagoon and around, Hokkaido, Japan

Schedule (Tentative plan):

Period: Feb. 18 ~ Mar. 3, 2002

17 18 19 20 21 22 23 24 25 26 27 28 01 02 03 04 05 06 07 08

S M T W T F S S M T W T F S S M T W T F

Meeting in Tokyo

Observation in Hokkaido

Members: Teruo Aoki (MRI)
Masahiro Hori (NASDA/EORC)
Tomonori Tanikawa (Univ. of Tsukuba)
Hans Eide (Stevens Institute of Technology)
one student (Stevens Institute of Technology)
logistic supports by a contractor (Restec or other)