Spatio-temporal variability of snow surface albedo and grain size derived from airborne and ground-based observations in Antarctica


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Key facts
10/12/2013 – 31/01/2014: Measurements
Kohnen station: 75°00’S, 0°40’E, 2892m a.s.l.
Polard: 16 research flights, 60 flight hours

1. Motivation and Objectives

- Airborne measurements of the spatial variability of surface albedo, BRDF, SSA and surface roughness
- Ground-based measurements of the temporal variability of surface albedo, BRDF and SSA to improve prognostic snow models.

2. Campaign ANT-Land 2013/2014

- Measurement of snow grain size
- Radiation measurements: Broadband and spectral radiation measurements

3. Impact of specific surface area and clouds on surface albedo

- SSA in m²/kg
- Free surface area: CE-Cube System (by AZ Photonic Sensors) Ø1310mm, daily, along 1000 profile
- Breadboard radiation: two CA22 pyranometers (Kipp&Zonen)

4. Temporal variability of SSA observed by different in situ and remote sensing methods

- Satellite: MODIS SGP3 retrieval
- Snow Grain Size and Pollution amount retrieval, after Zege et al. (2011)

5. Summary and conclusion

- Cloud abundance in the lowest cloud layer increases albedo by 3%.
- Albedo increase by 3% is also provided by SSA increase of 18 m²/kg⁻¹.
- Snow grain size varies between 20 m²/kg⁻¹ and 95 m²/kg⁻¹, 4 maxima due to precipitation events.
- MODIS: Systematic underestimate, CORAS mostly within standard deviation of in situ data.

6. Outlook

I. Further development of grain size retrieval, e.g. using different albedo model
II. Apply retrieval to airborne measurements (Polard overflights)
III. Simulation and validation of temporal variability of snow grain size with microphysical snow model SNOWPACK

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