

Snow in the Earth system: Major impacts on the surface-atmosphere Energy & Water exchanges

Snow specific thermal and radiative properties: High albedo and Low thermal conductivity

- *Over ice (lakes, rivers, ice sheets): Reduction of heat conduction flux → ice growth reduced*
- *Impacts soil temperatures, i.e., ground freezing/thawing, carbon decomposition, soil respiration and methane emissions*
- *Impacts surface roughness (smoothing effect on vegetation)*
- *Buffers water transfers to runoff and infiltration,*
- *Impacts soil moisture dynamics and vegetation phenology*
- *Feedback to the atmosphere through non-linear processes (energy and water transfers)*



Snow in ORCHIDEE

Previous versions: different treatment of VEG, NOBIO (glaciers):

Over NOBIO: Old snowpack model (Chalita and Letreut, 1994)

Over VEG: Explicit snow 3-layer model (Wang et al., 2013)

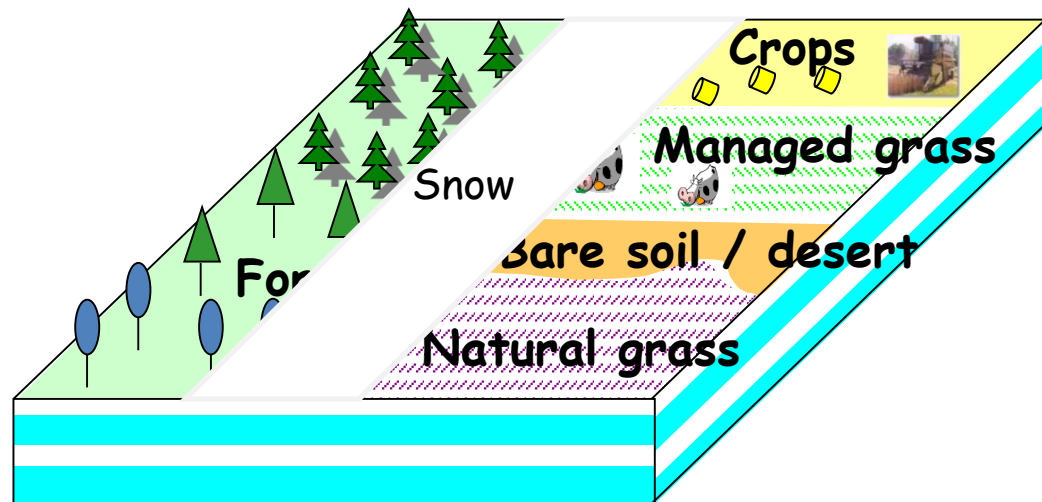
Now in the Trunk:

- same snow model adapted to ice surfaces

- Over VEG: deficiencies highlighted in the

albedo and frac_snow parameterizations

leading to atmospheric biases and amplified feedback



-->Motivate the on-going works...

Today's presentations: Land ice snow modelling , SCF and Albedo developments

- **Modeling snow cover over land ice:** the ice-sheet model (*Ch. Dumas, Sylvie Charbit, F. Maignan and C. Ottlé*)
- **Model calibration over Greenland** with albedo MODIS data (*N. Raoult, V. Bastrikov, S. Charbit, Ch. Dumas, F. Maignan, C. Ottlé*)
- **Coupling LMDZ and ORCHIDEE over ice sheets:** work in progress and prospects (*E. Vignon, J. Ghattas, Ch. Dumas, S. Charbit, C. Agosta, Ch. Amory, F. Cheruy*)
- **Discussion on ORCHIDEE-ICE developments**

- **Introduction of Light Absorbing Particles** in ORCHIDEE snow model (*S. Krishnakumar, S. Albani, M. Ménégoz, C. Ottlé, A. Cozic and Y. Balkanski*)
- **Revision of the snow cover fraction parameterization** over complex topography areas: atmospheric impacts (*M. Lalande, M. Ménégoz, G. Krinner, C. Ottlé and F. Chéruy*)
- **On-going calibration of the snow model** using ESA-CCI-Snow and MODIS products and ORCHIDAS tools (*A. Cuynet, G. Cossio, B. Lecomte, C. Ottlé, N. Raoult, V. Bastrikov and Ph. Peylin*)
- **Discussion on snow model developments**, further developments and tests/evaluation tasks, other projects around snow modeling ? ...