

A REVIEW IN SNOW SALTATION DYNAMICS AND ITS IMPLICATIONS FOR THE SURFACE MASS BALANCE

Daniela Brito Melo, Varun Sharma, Franziska Gerber,
Francesco Comola, Armin Sigmund, Michael Lehning

13 December 2021

AGU FALL
MEETING

SCIENCE
is SOCIETY

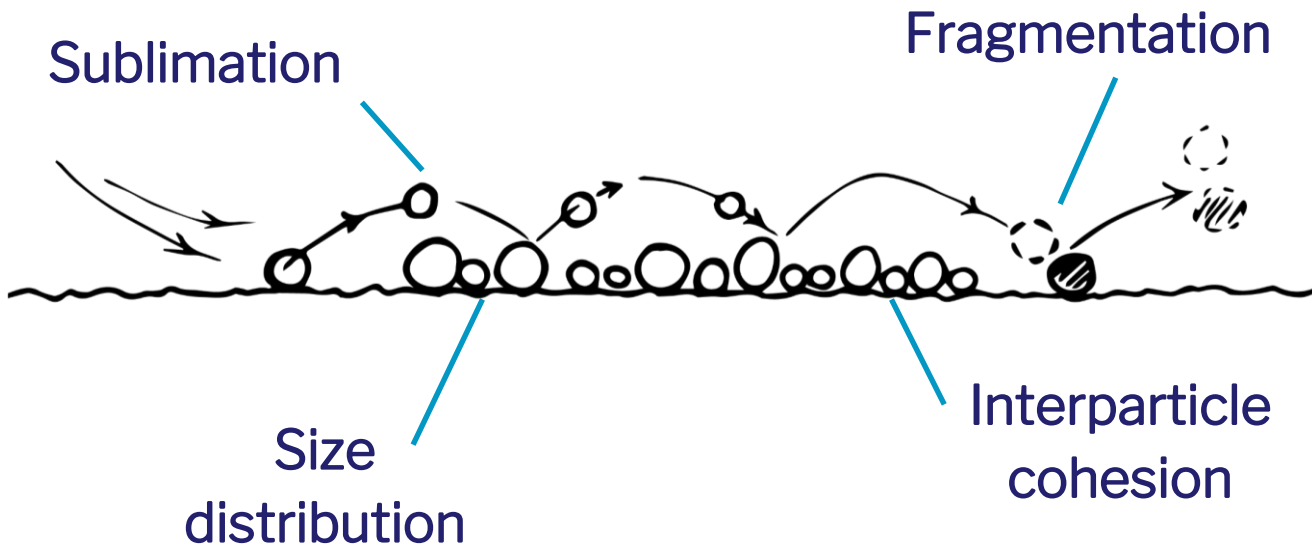




SNOW SALTATION

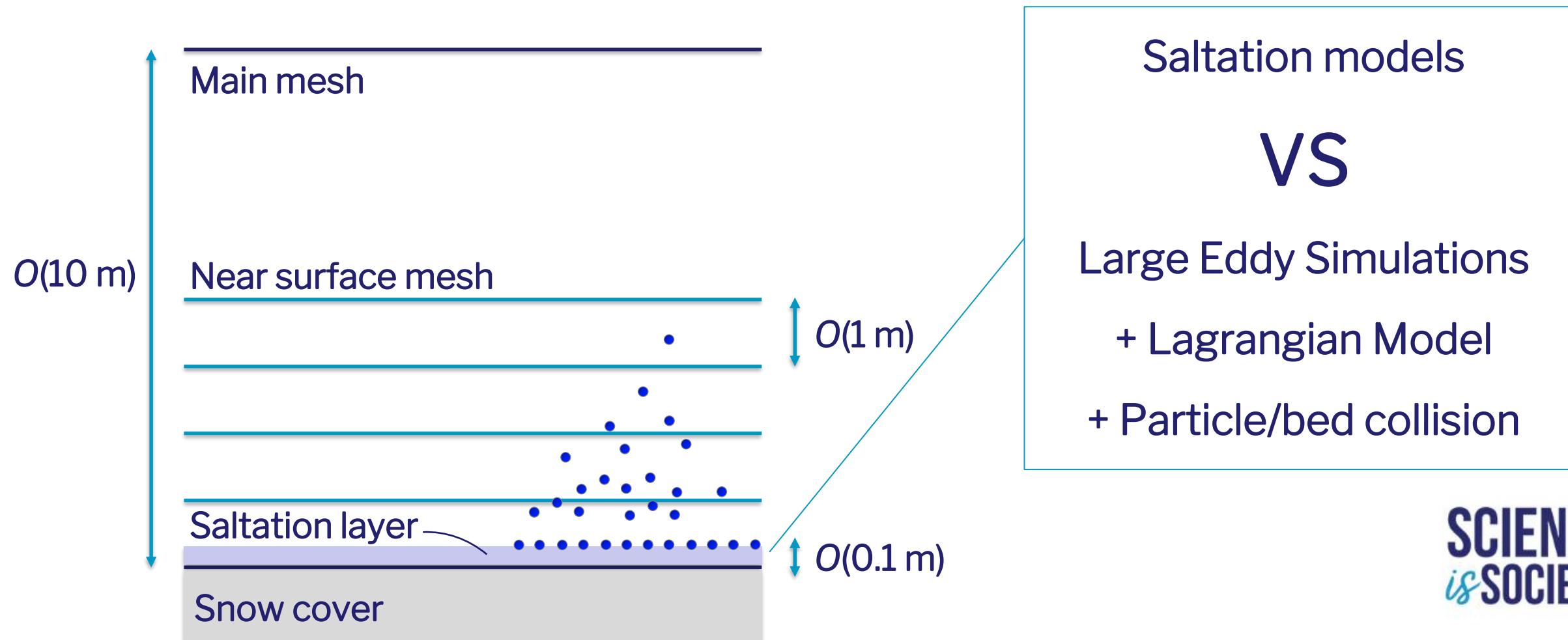
Hendrik Huwald, Antarctica (PE)

Wind induced snow transport close to the surface.



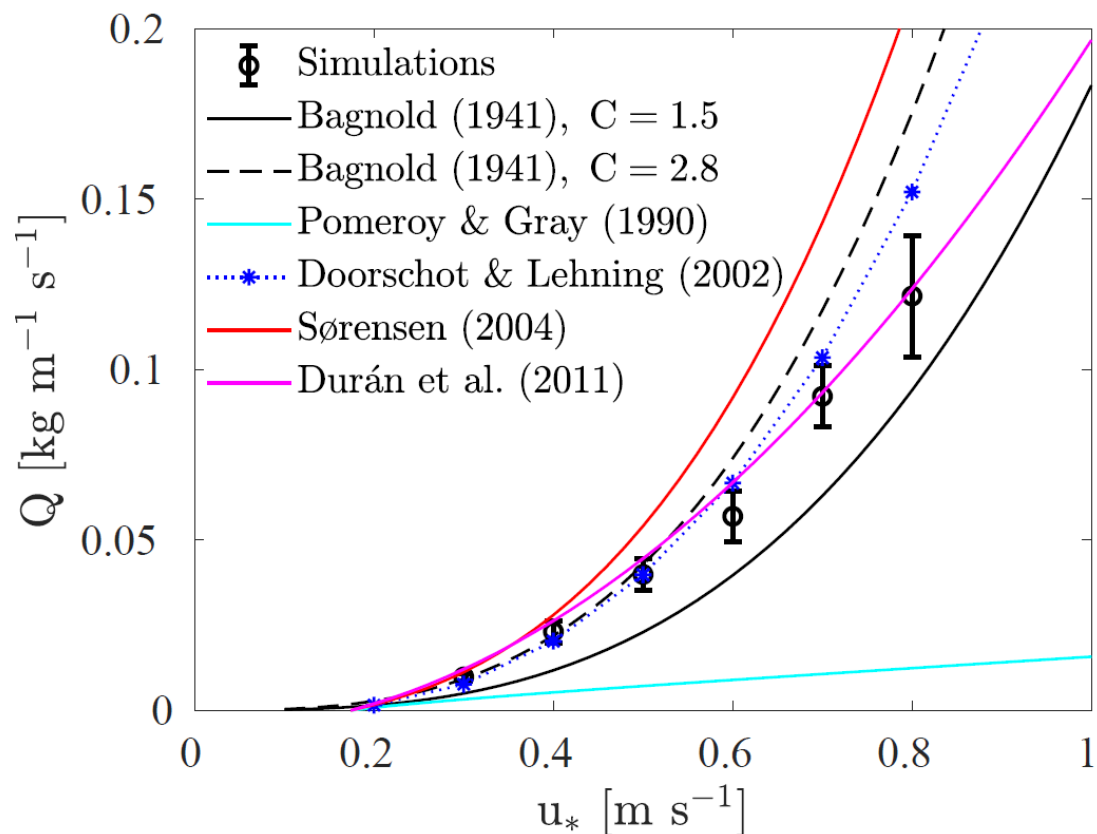


MODELING... SALTATION





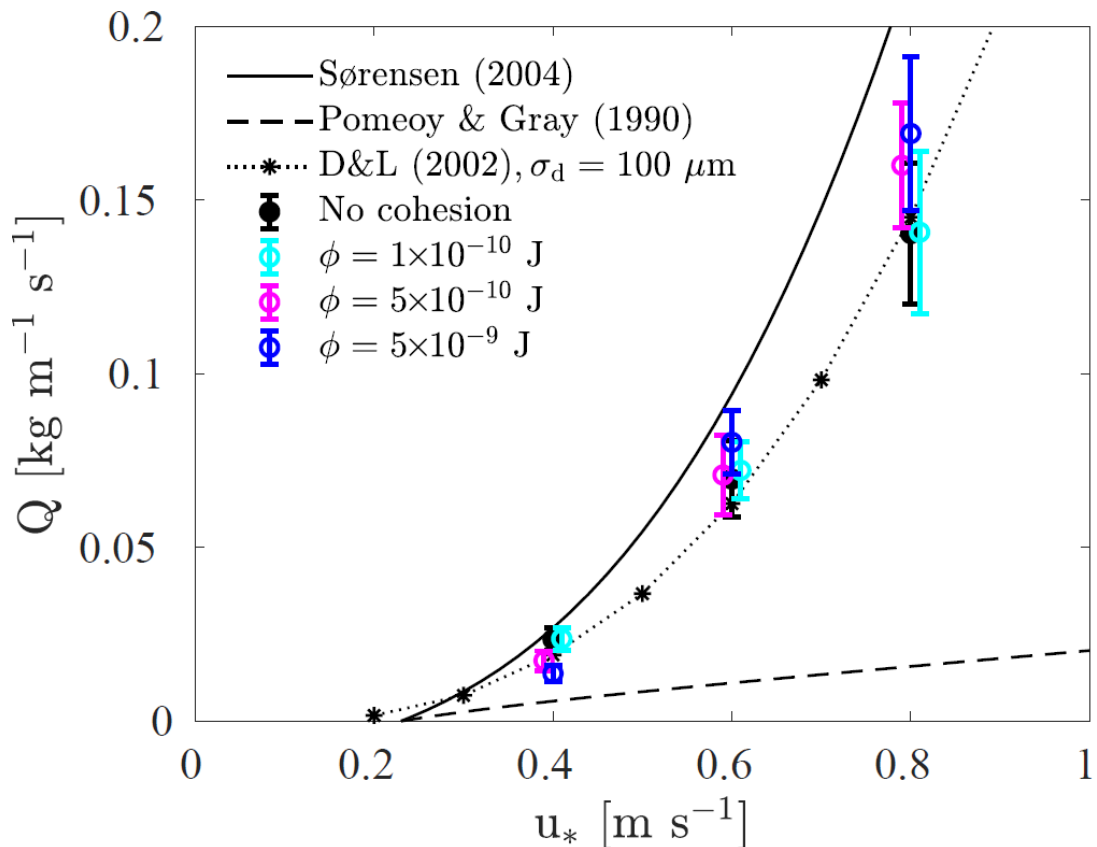
SALTATION MODELS VS SIMULATION RESULTS



Quadratic or cubic models have a better agreement with simulations.



SALTATION MODELS VS SIMULATION RESULTS



The mass flux decreases with cohesion for low friction velocities,

and increases with cohesion for high friction velocities.



CLOSING REMARKS

- Advanced models are a useful tool to understand the saltation dynamics.
- Current saltation models can be improved to take into account the snow characteristics as grain size and cohesion.
- Snow saltation leads to snow redistribution, modifies the snow height and enhances sublimation losses.
- Its correct modeling improves the surface mass balance predictions and the avalanche danger forecast.

THANK YOU

Daniela Brito Melo, PhD student
daniela.britomelo@epfl.ch

Ecole Polytechnique Fédérale de Lausanne (EPFL)
Laboratory of Cryospheric Sciences

REFERENCES

Bagnold, R. A. (1941). *The physics of blown sand and desert dunes*. Dover Publications.

Doorschot, J., Lehning, M. (2002). Equilibrium saltation: Mass fluxes, Aerodynamic Entrainment and Dependence on Grain Properties. *Boundary-Layer Meteorology*, 104 (1), 111-130.

Durán, O., Claudin, P., Andreotti, B. (2011). On aeolian transport: Grain-scale interactions, dynamical mechanisms and scaling laws. *Aeolian Research*, 3 (3), 243-270.

Melo, D. B., Sharma, V., Comola, F., Sigmund, A., Lehning, M. Modeling snow saltation: the effect of grain size and interparticle cohesion. *Journal of Geophysical Research: Atmospheres*. [in print]

Pomeroy, J. W., Gray, D. M. (1990). Saltation of snow. *Water Resources Research*, 26 (7), 1583–1594.

Sørensen, M. (2004). On the rate of aeolian sand transport. *Geomorphology*, 59 (1), 53–62.