Understanding and Modeling Energy Budgets of Snowpack Using Observations of SAIL/SPLASH/SOS

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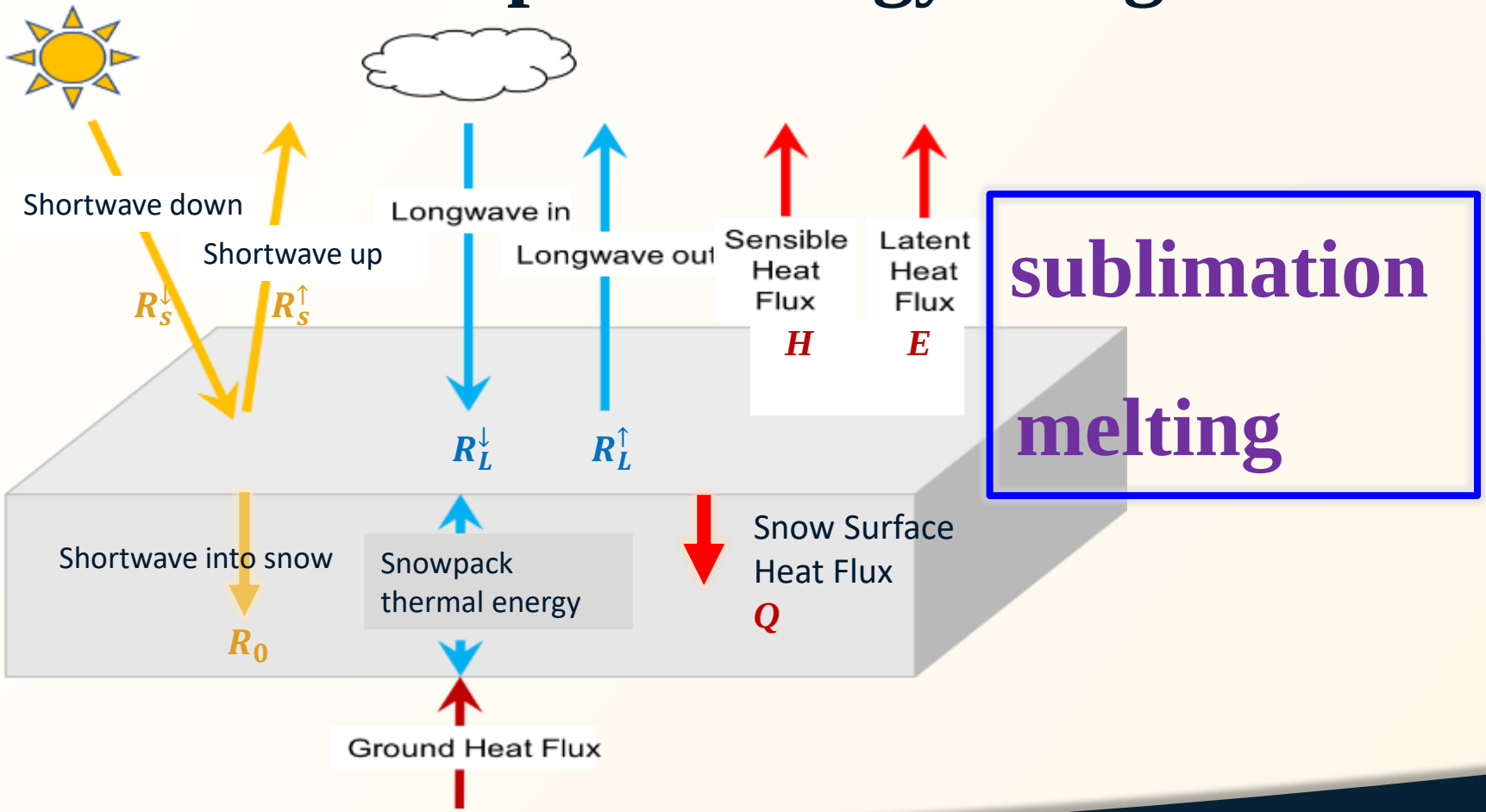
Snowpack Energy Budget



Bulk-Flux Model (gradient based)

$$E = \rho \lambda C_E U \left(q_s - q_a \right)$$

$$H = \rho c_p C_H U \left(T_s - T_a \right)$$

T_s -T_a : bulk temperature gradient
q_s - q_a : bulk humidity gradient
C_H = C_E : transfer coefficients (stability, surface roughness)
U : wind speed

Challenges in Modeling Sublimation

- Parameterization of stable boundary layer turbulence
- Uncertainty of snow surface roughness and temperature/humidity gradient

Maximum Entropy Production (MEP) Model

- Closing energy balance and constrained by radiation fluxes
- Independent of roughness, wind speed and temperature /humidity gradient

Science Questions about Sublimation and Melting Process

- Do melting and sublimation occur simultaneously?
- Does melting occur at snow surface or within snowpack?

Summary

SAIL/SPLASH/SOS Field Observations

- Validating sublimation model
- Understanding sublimation, surface/volume melting and snowpack energy budget

https://www.arm.gov/news/blog/post/

Photos are courtesy of SAIL technician Travis Guy.