



SnowMIP2: Implications for NWP Snow Schemes

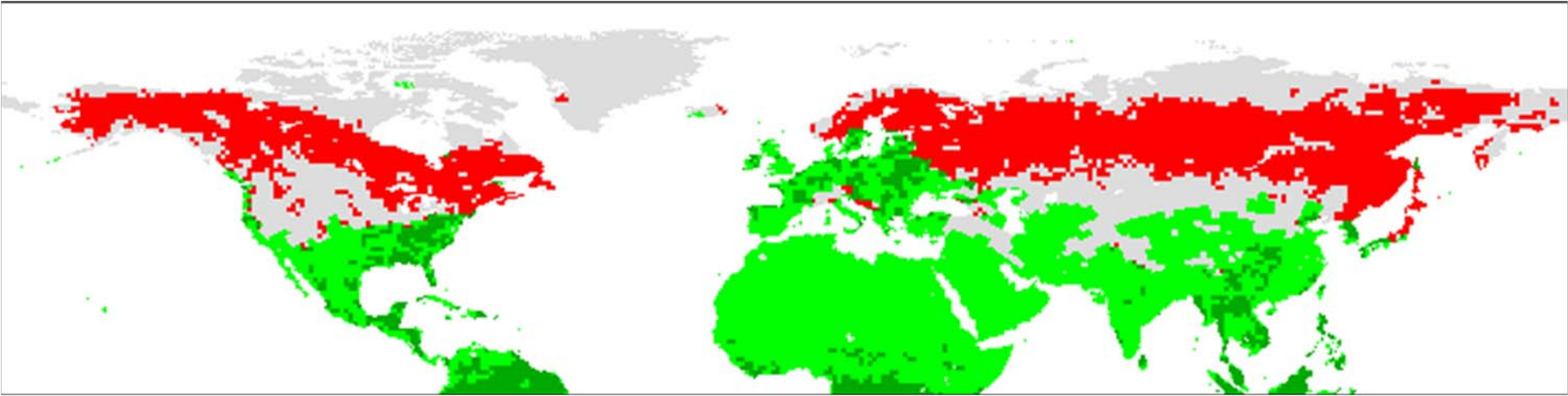
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... and the SnowMIP2 participants

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Forests and Snow

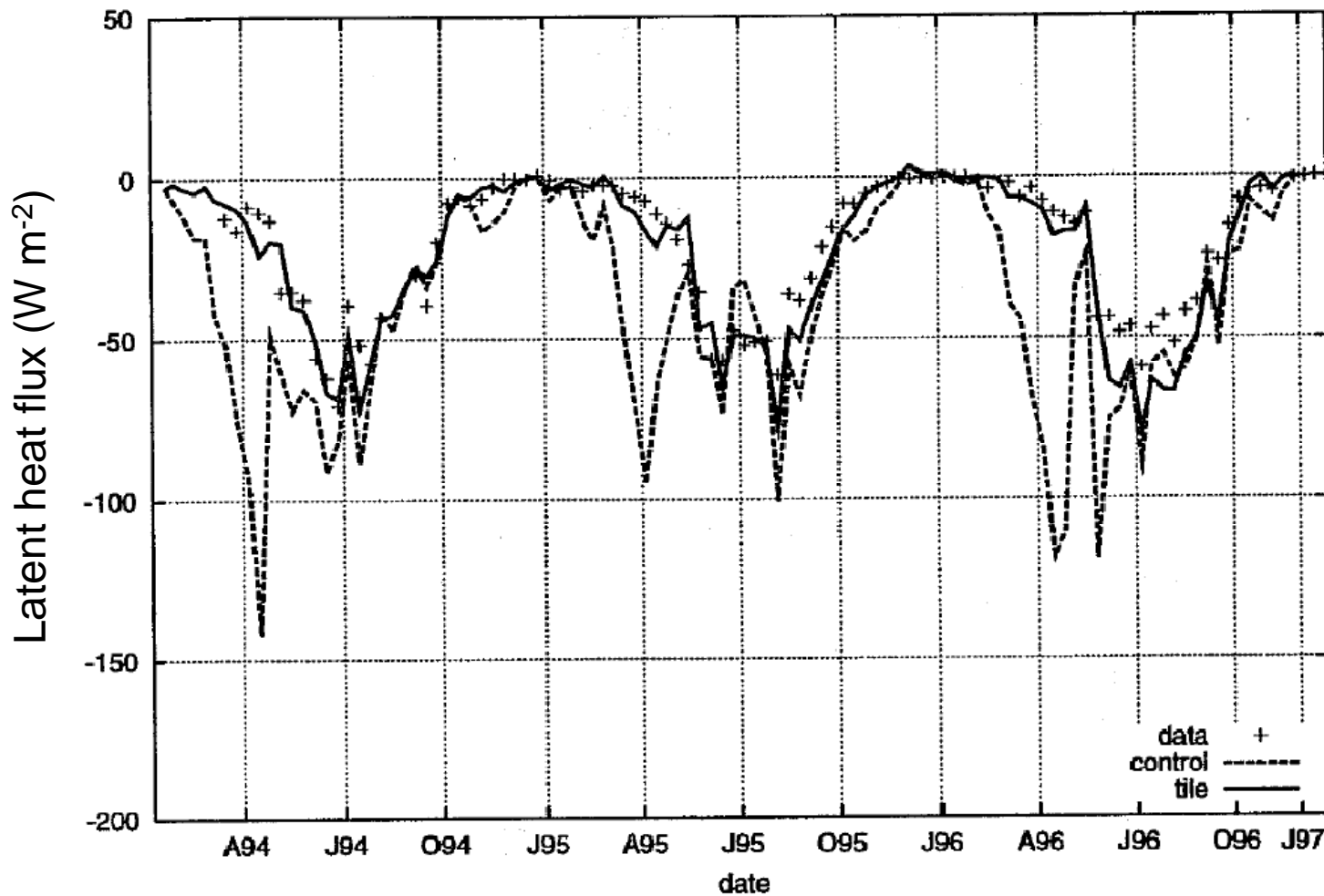


Forests (University of Maryland global land cover classification) and January 2005 snow cover (NSIDC) – overlap in red

“Large discrepancies remain in albedo for forested areas under snowy conditions due to difficulties in determining the extent of masking of snow by vegetation”
IPCC AR4

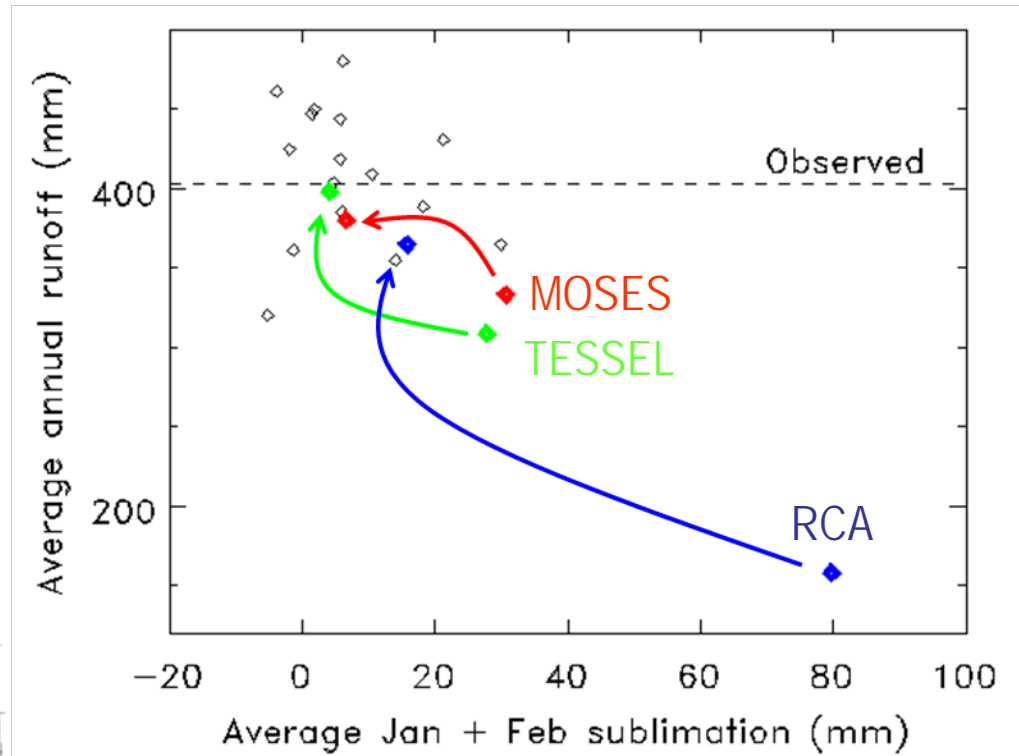
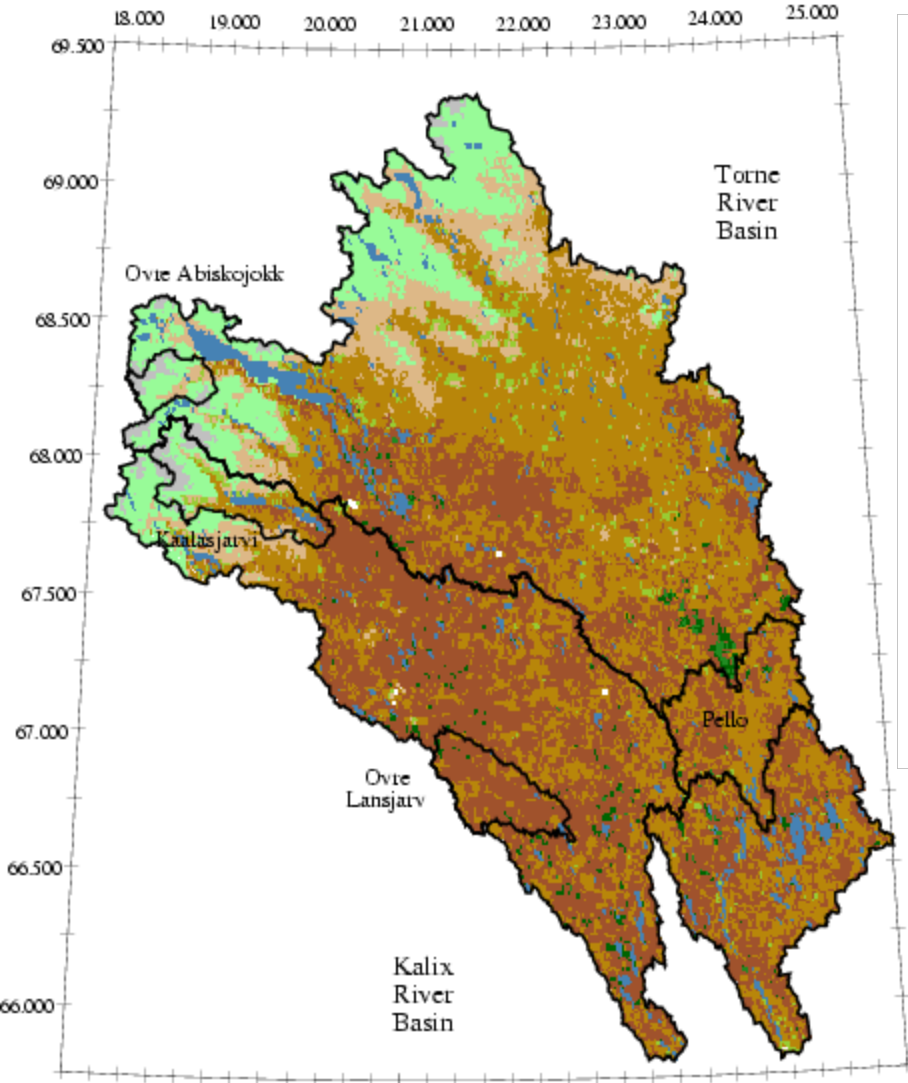
Implications of BOREAS

Introduction of tile for snow under high vegetation in TESSEL



Van den Hurk, Viterbo, Beljaars and Betts, 2000. ECMWF Technical Memo 295
Betts, Viterbo, Beljaars and van den Hurk, 2001. *J. Geophys. Res.*, **106**(D24)

Implications of PILPS2e



Essery and Clark, 2003.

Van den Hurk and Viterbo, 2003.

Samuelsson, Bringfelt and Graham, 2003.

Glob. Planet Change, **38**(1-2)

- | | | |
|------------------|------------------|----------------|
| Water | Woodland | Open shrubland |
| Evergreen forest | Wooded grassland | Grassland |
| Mixed forest | Closed shrubland | Bare ground |

SnowMIP Sites



● SnowMIP1

Col de Porte	(45.3°N, 5.8°E)
Goose Bay	(53.3°N, 60.4°W)
Sleepers River	(44.5°N, 72.2°W)
Weissfluhjoch	(46.8°N, 9.8°E)

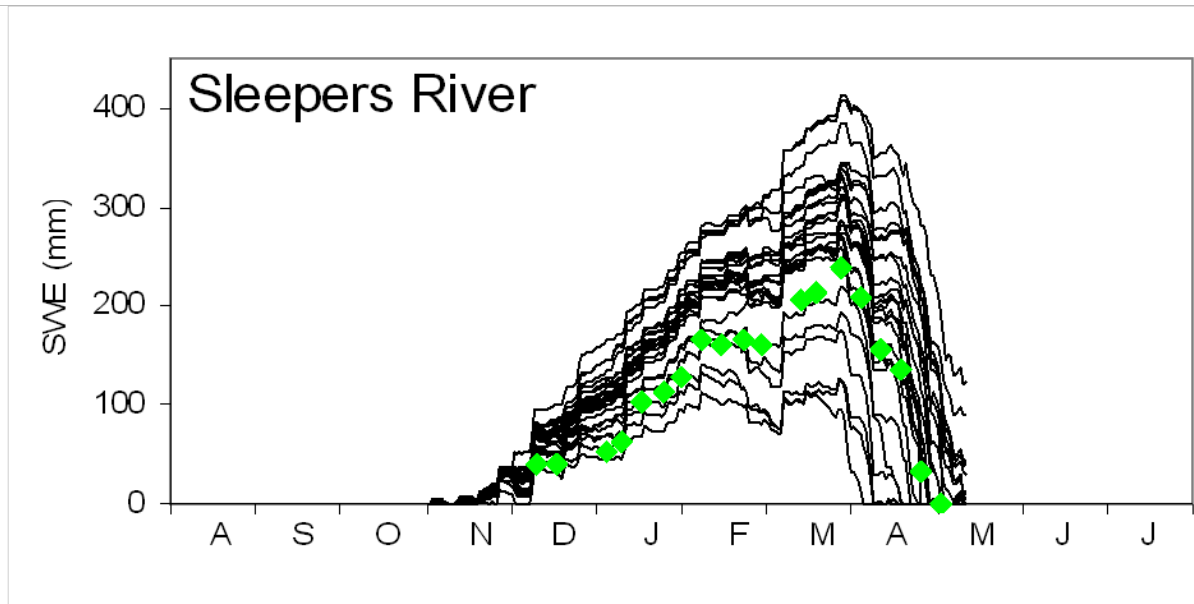
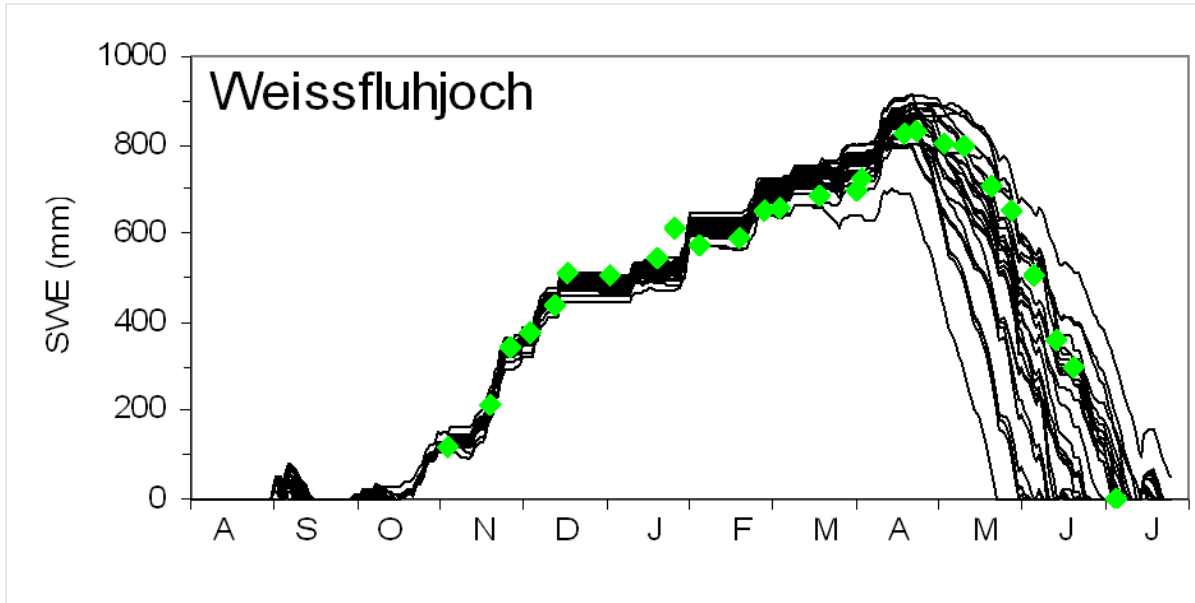
24 models

● SnowMIP2

Alptal	(47.3°N, 8.7°E)
BERMS	(53.6°N, 104.4°W)
Fraser	(39.5°N, 105.5°W)
Hitsujigaoka	(42.6°N, 141.2°E)
Hyytiälä	(61.5°N, 24.2°E)

33 models

SnowMIP1 SWE Simulations



SnowMIP2 Sites

Alptal, Switzerland



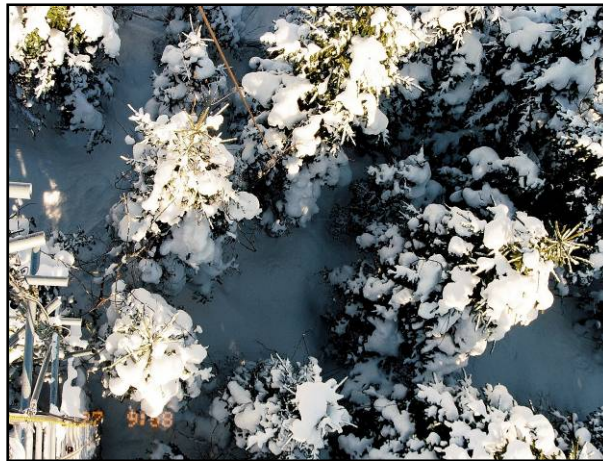
BERMS, Saskatchewan, Canada



Fraser, Colorado, USA



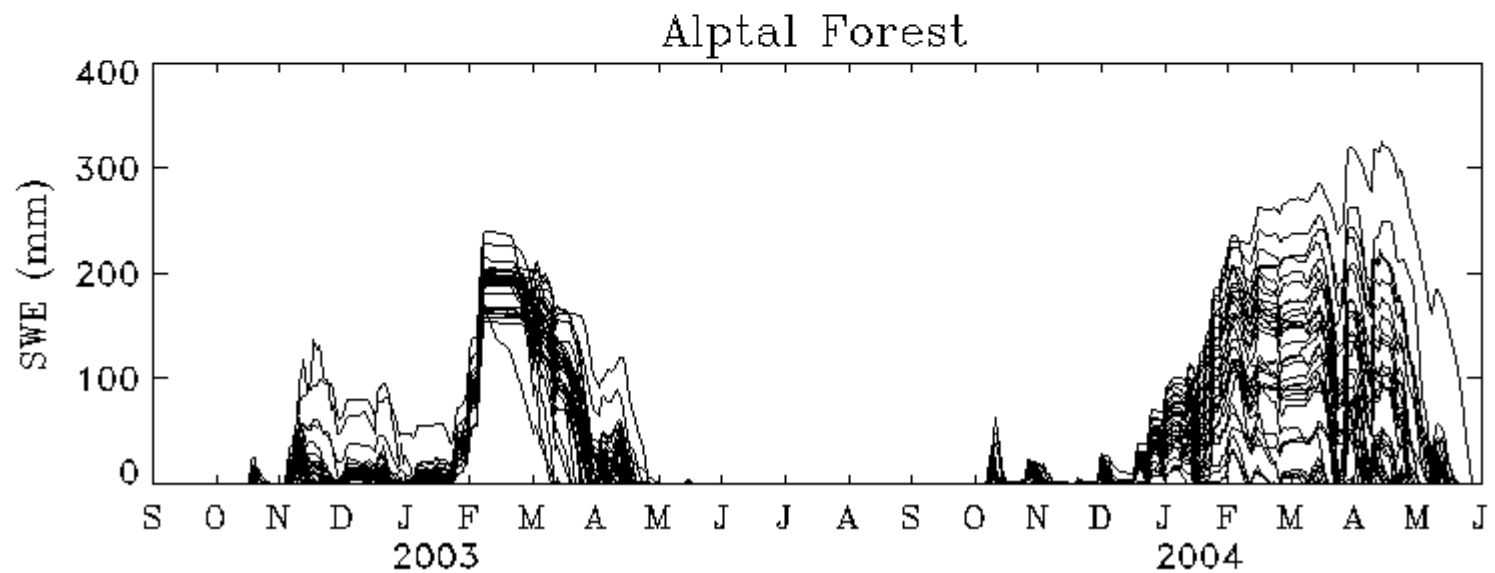
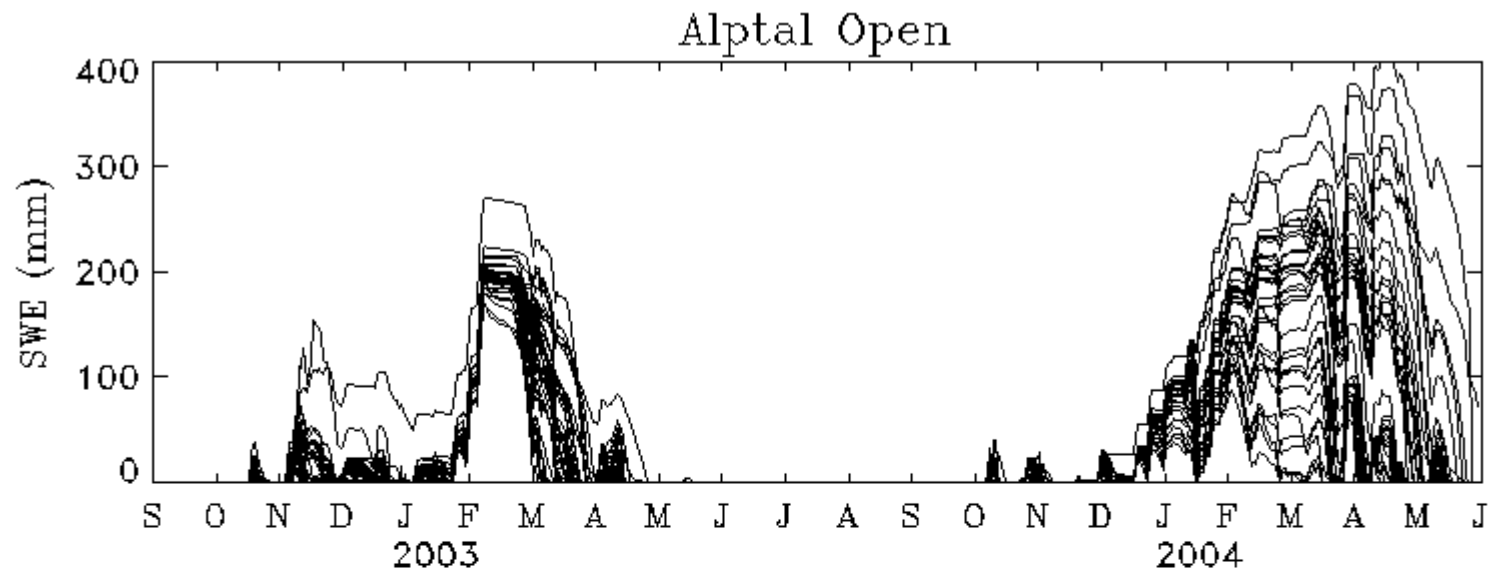
Hitsujigaoka, Japan



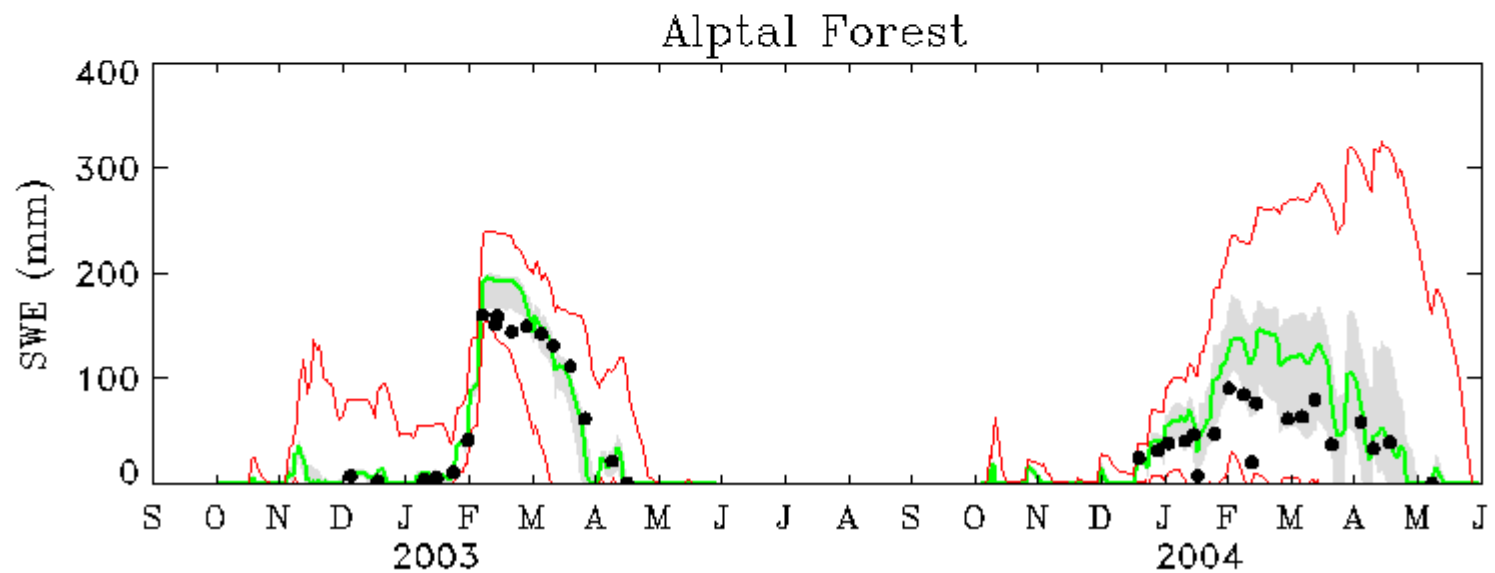
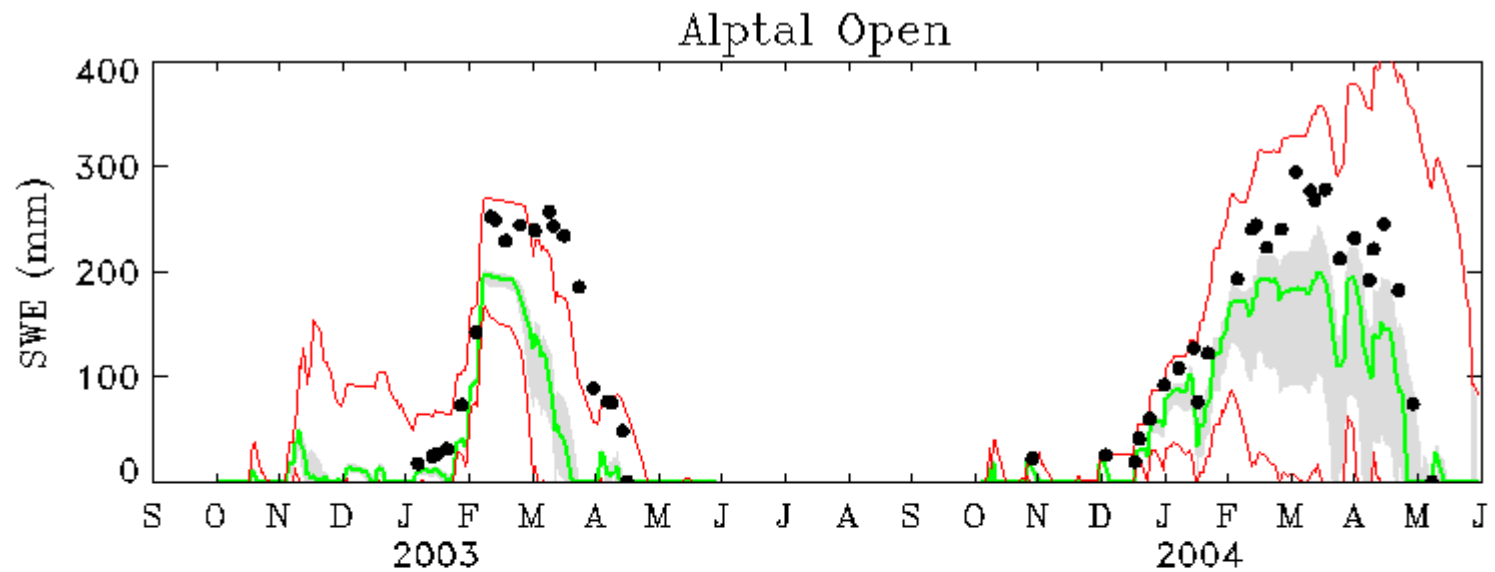
Hyytiälä, Finland



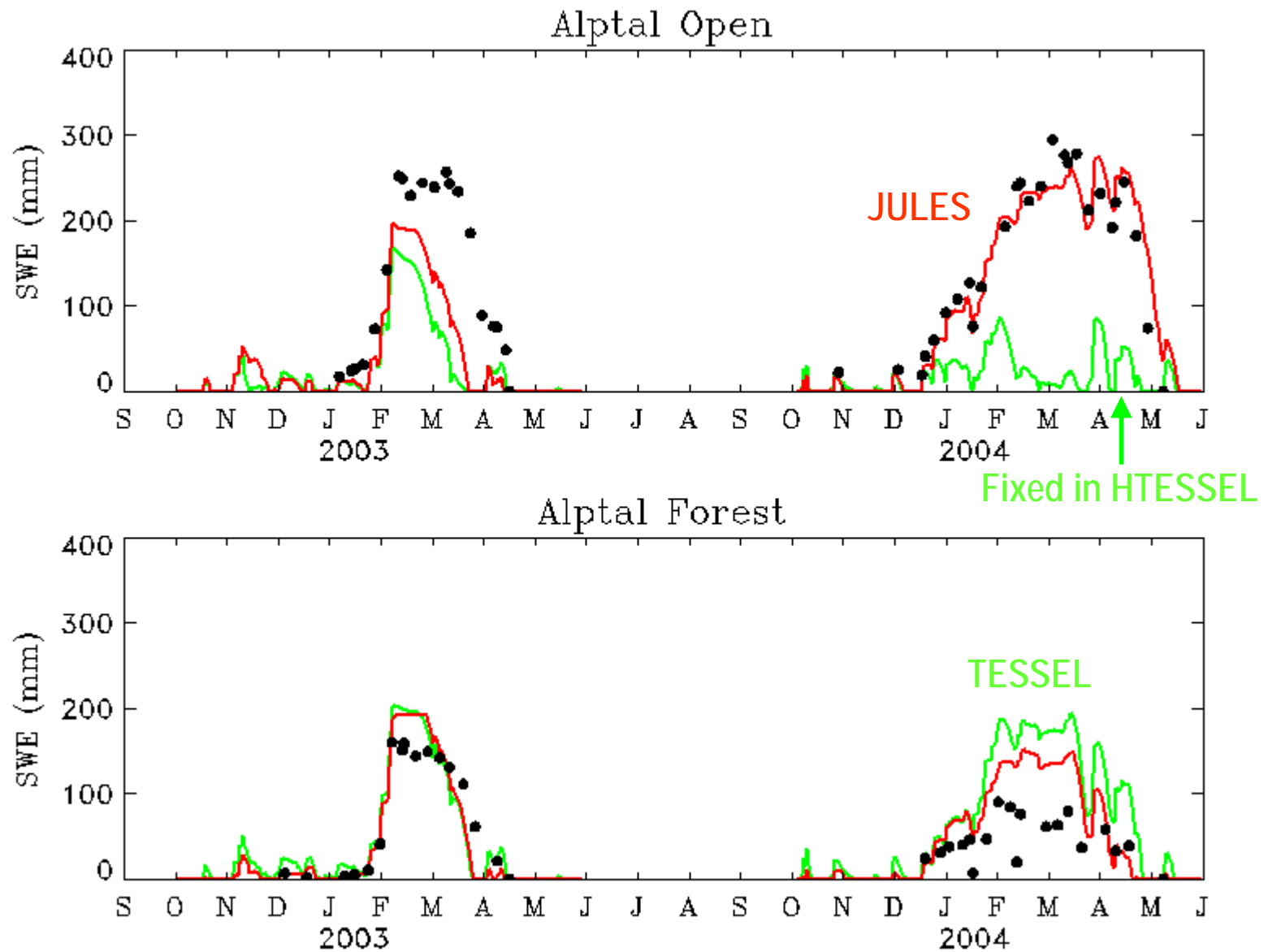
Open and Forest SWE Simulations



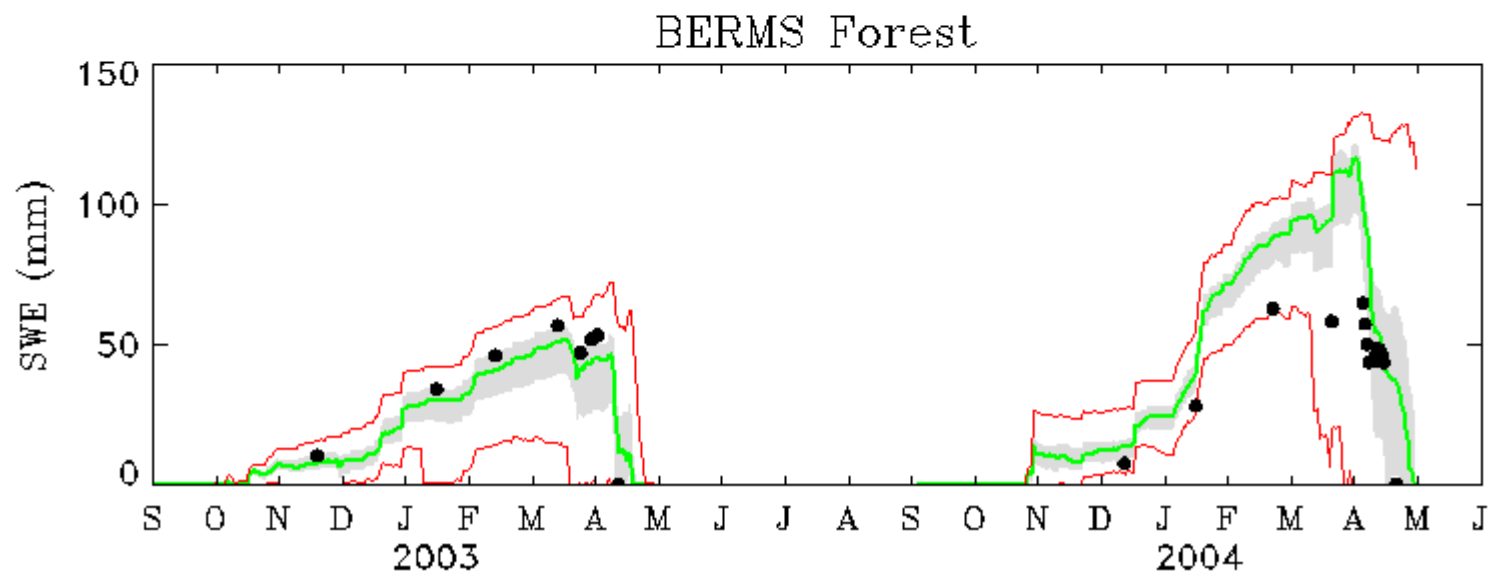
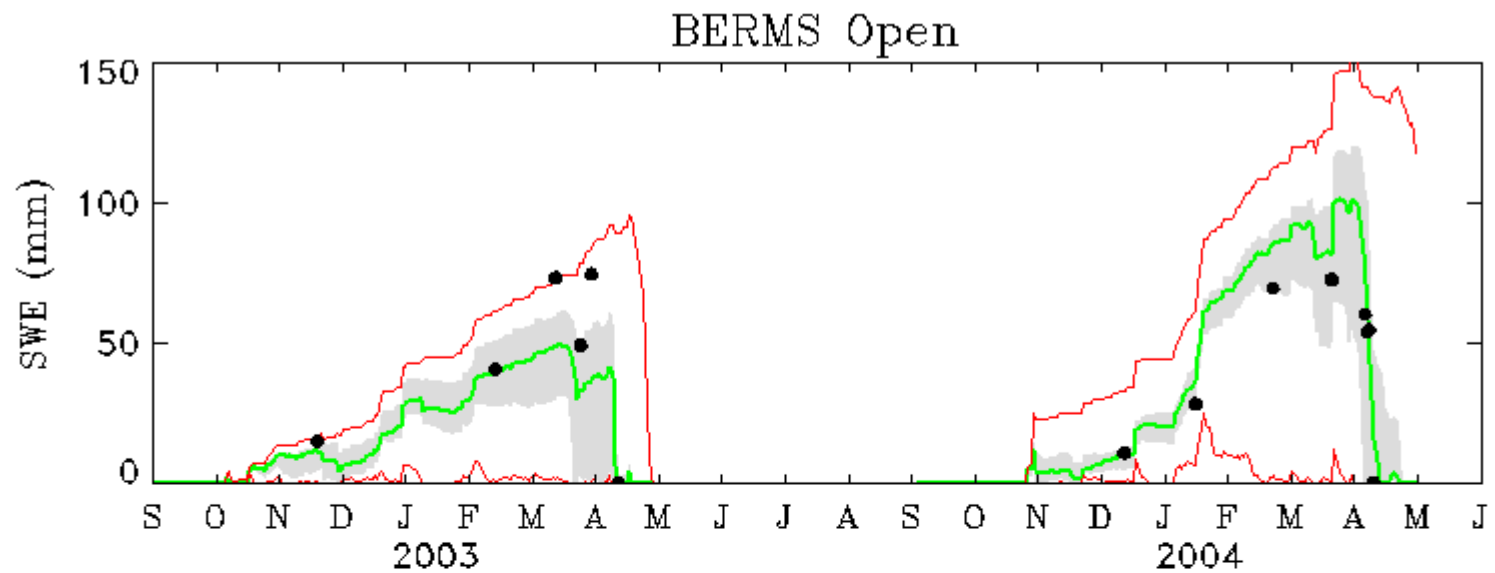
Open and Forest SWE Simulations



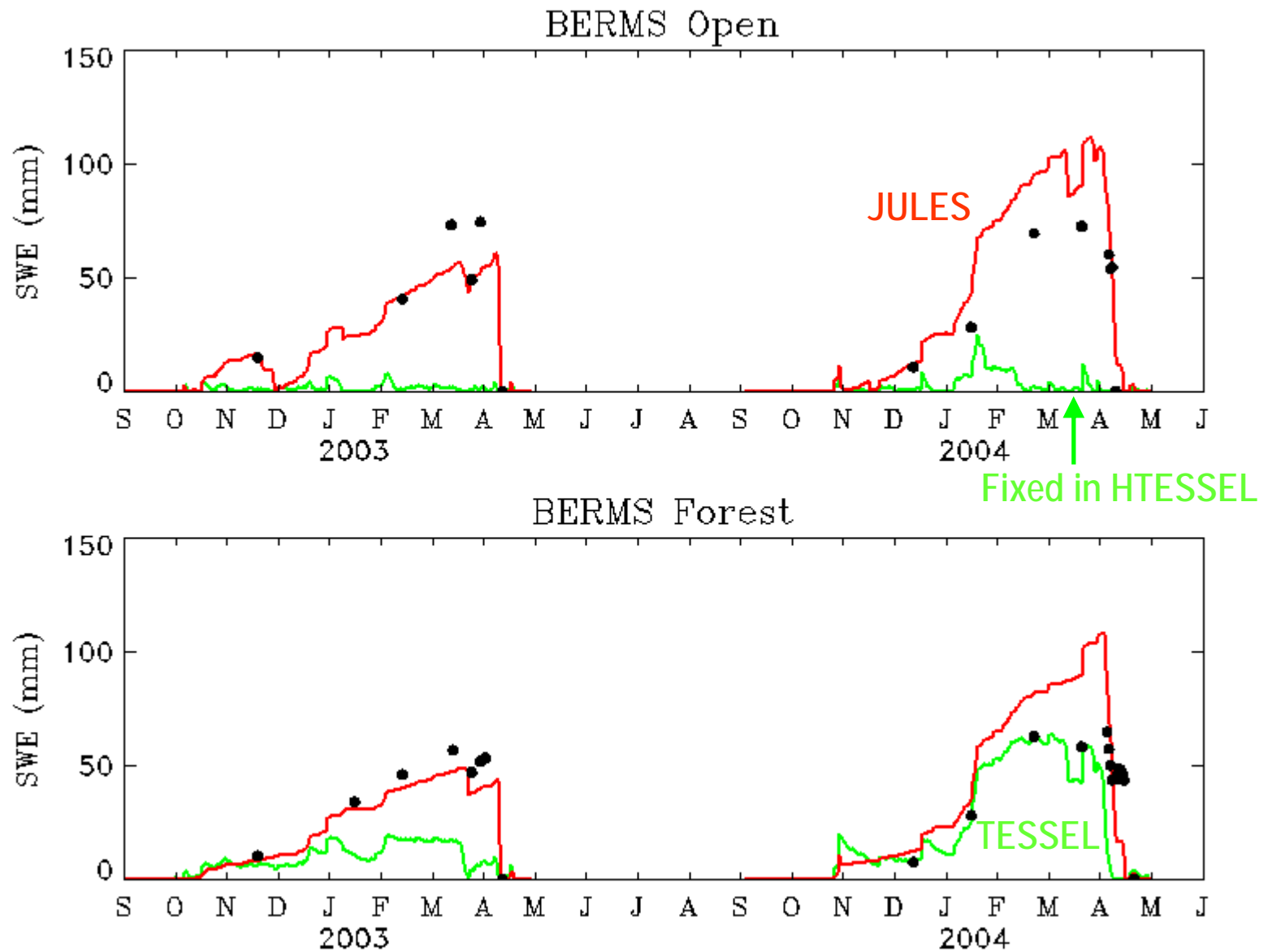
Open and Forest SWE Simulations



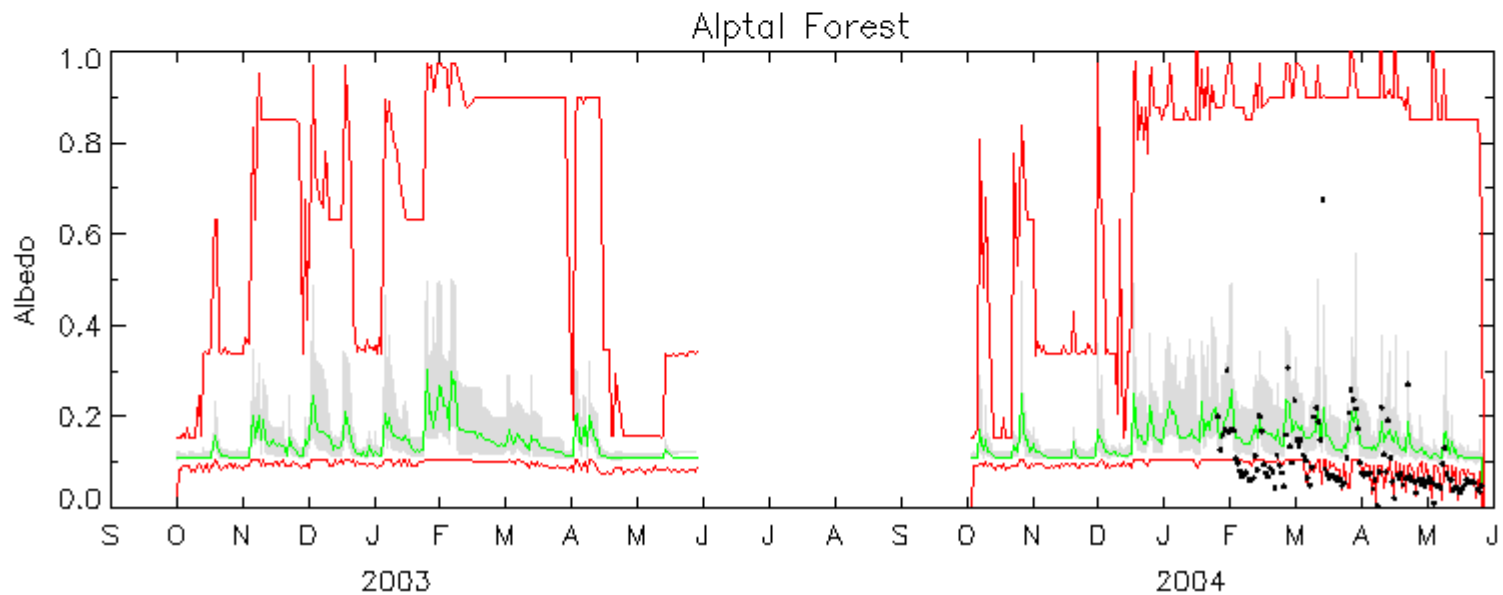
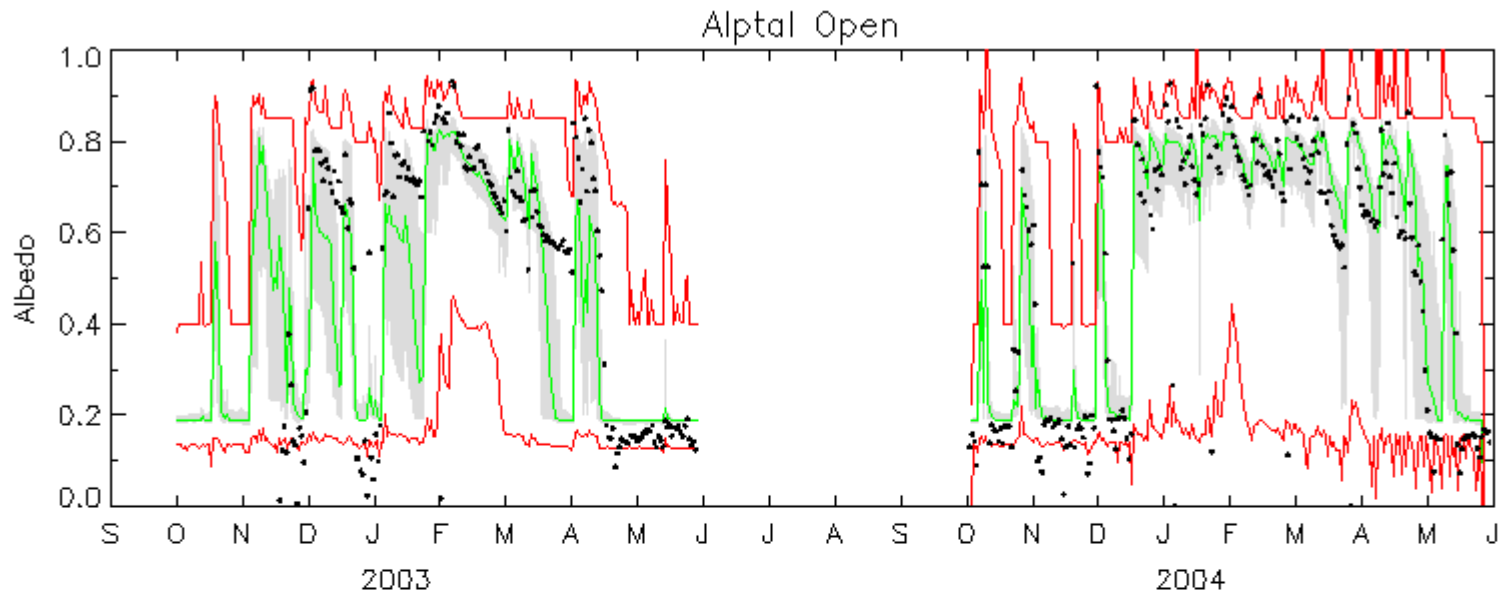
Open and Forest SWE Simulations



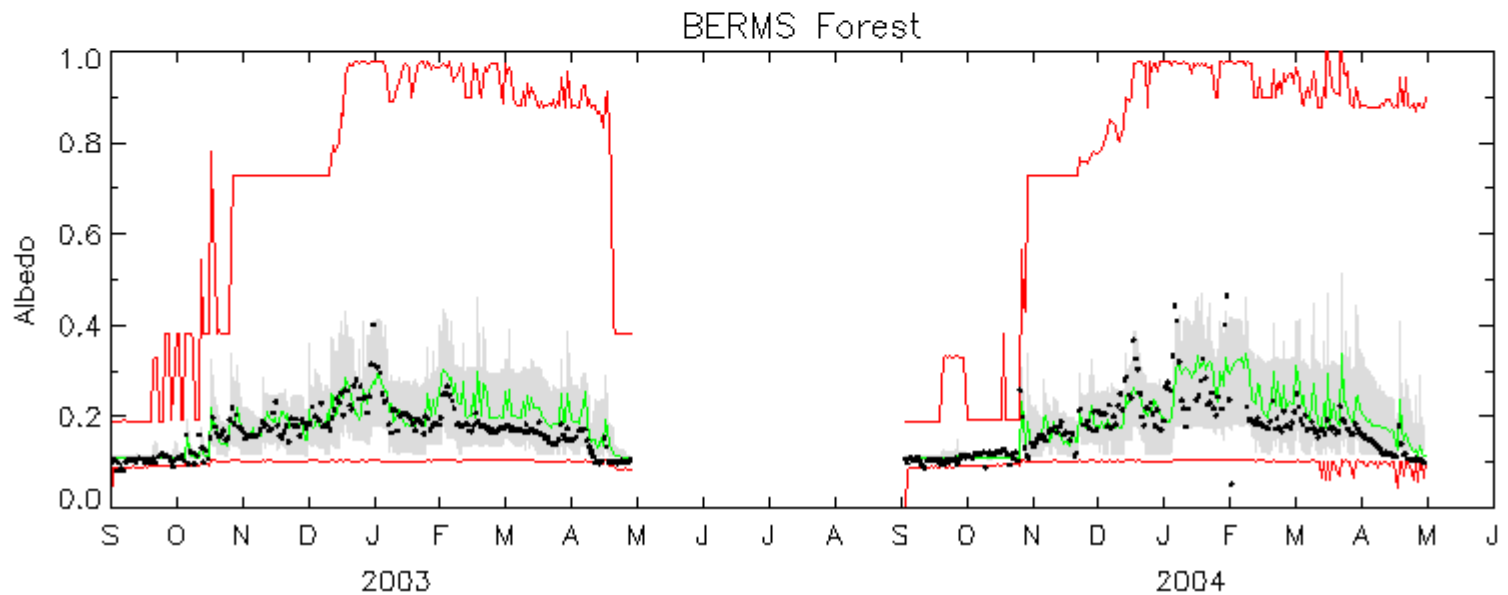
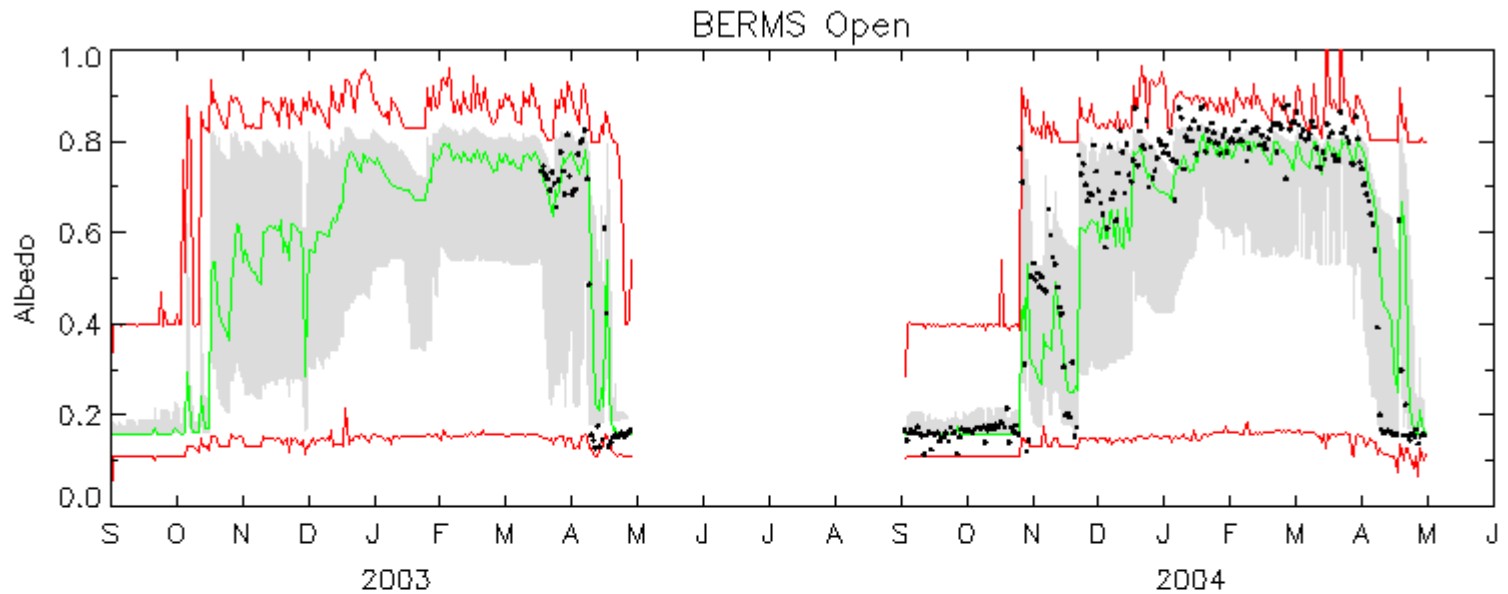
Open and Forest SWE Simulations



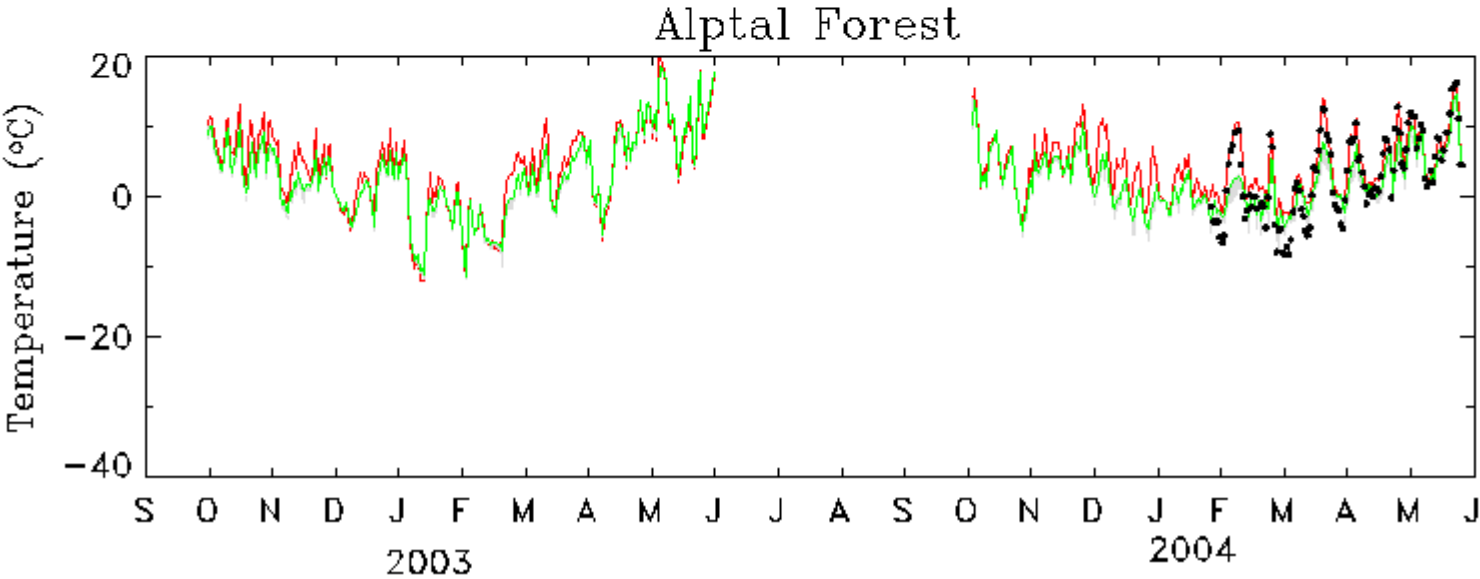
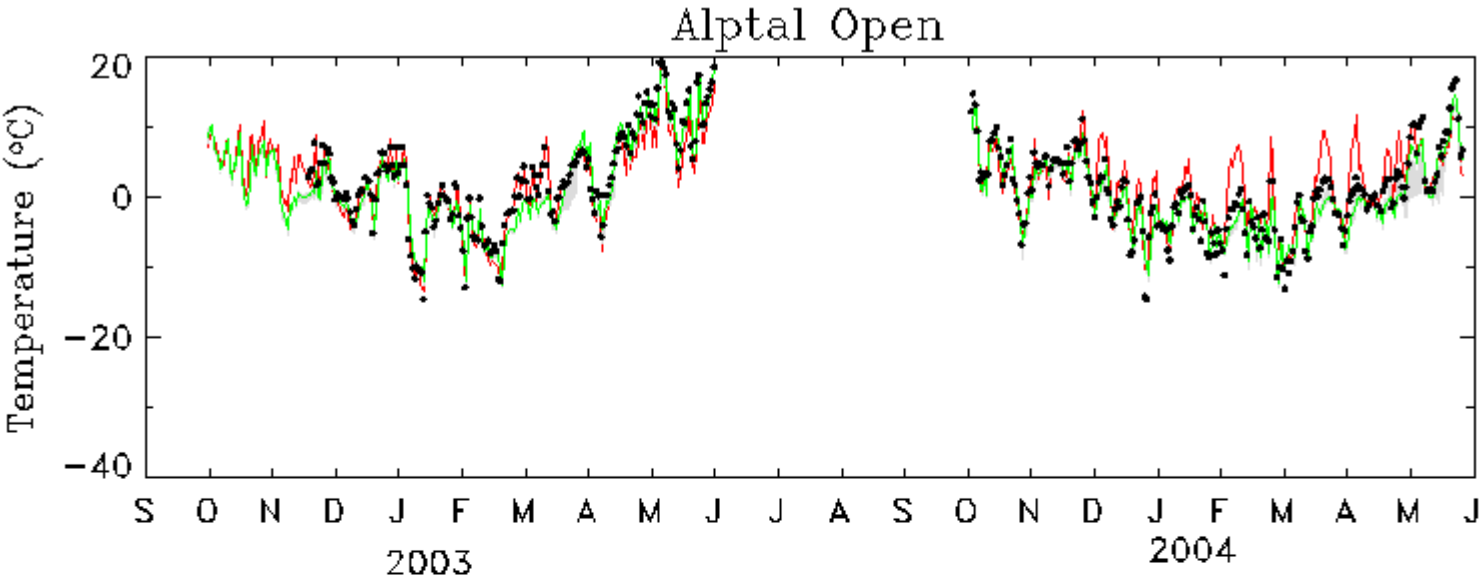
Open and Forest Albedo Simulations



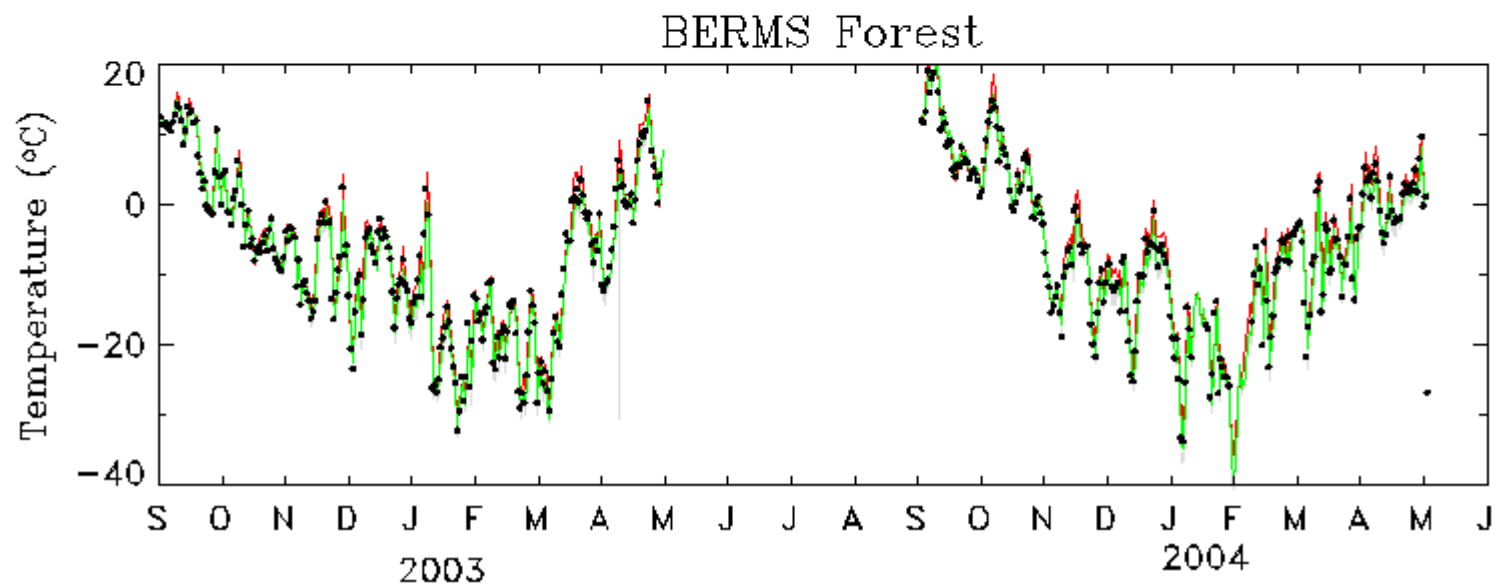
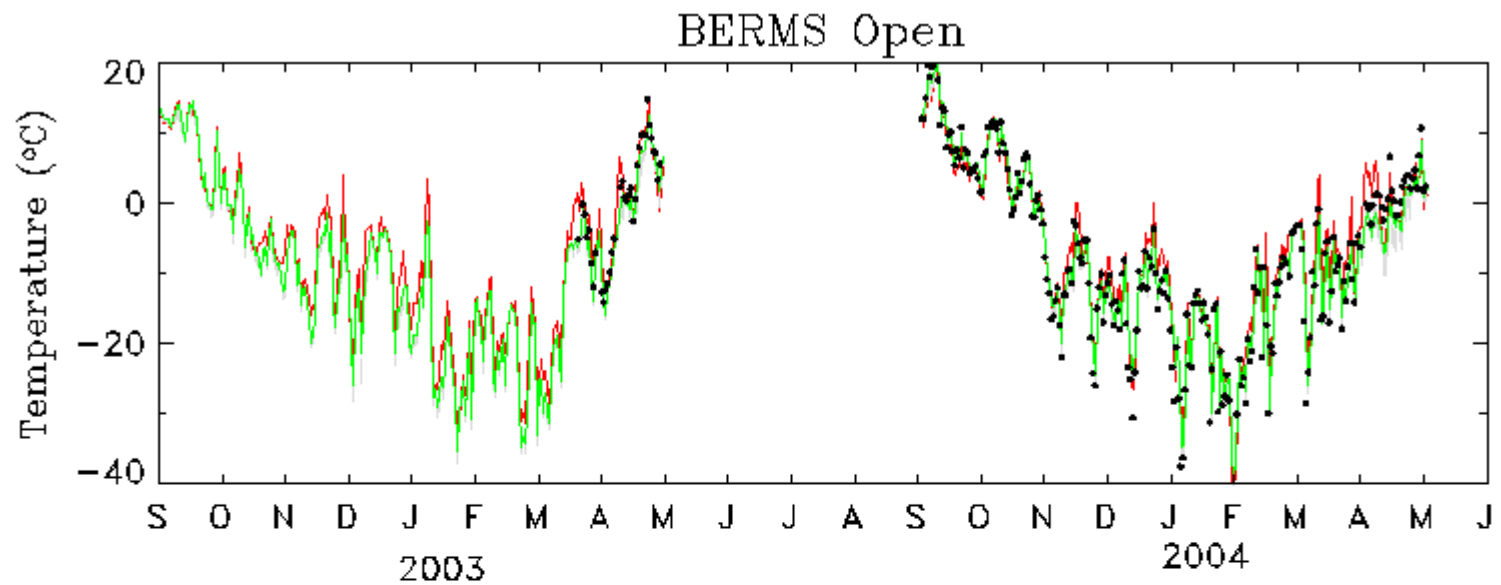
Open and Forest Albedo Simulations



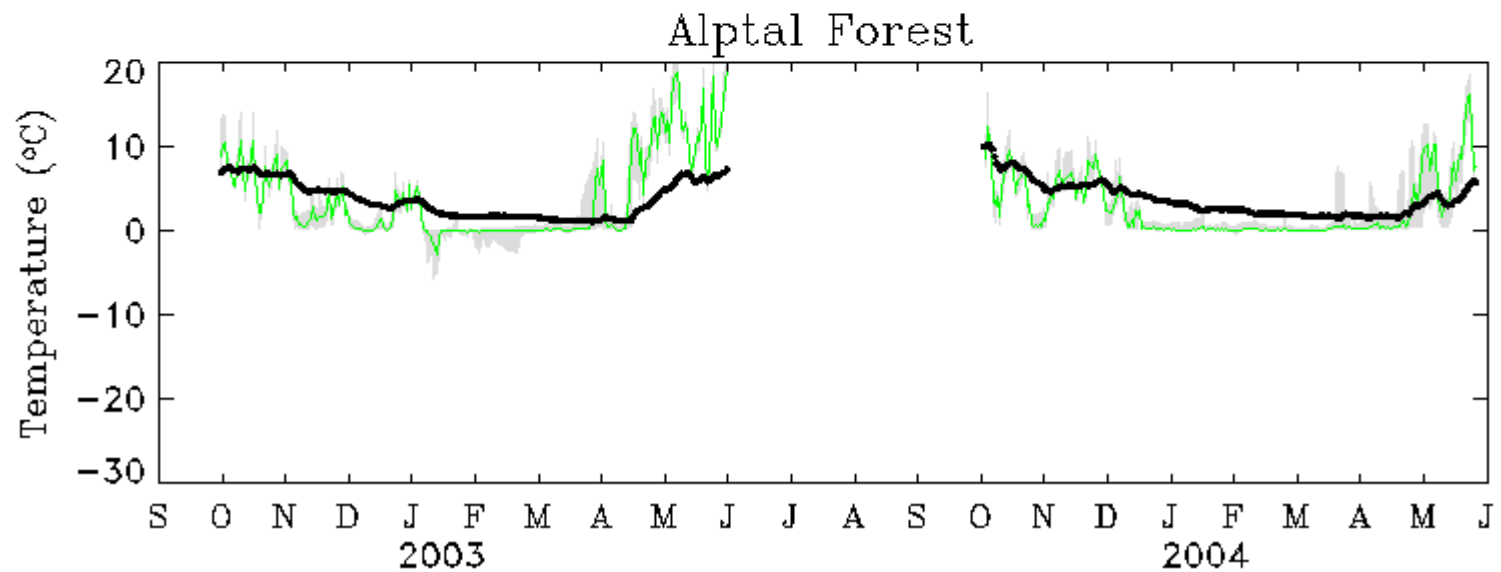
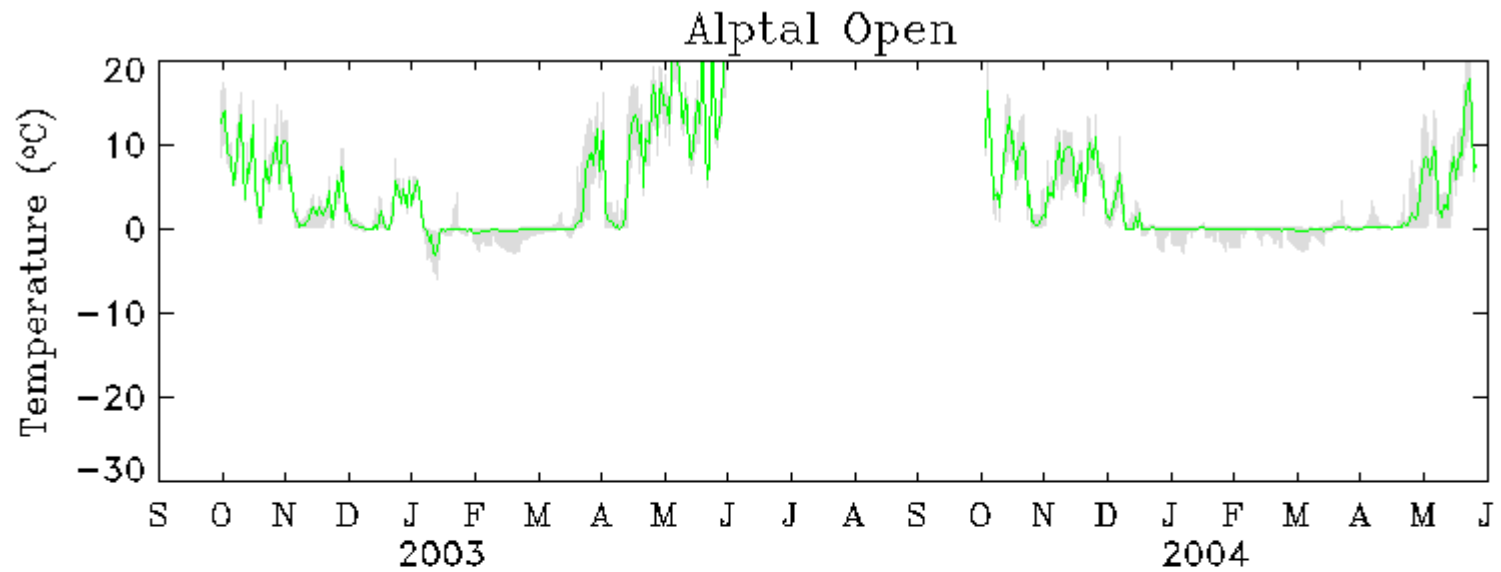
Open and Forest Surface Temperature Simulations



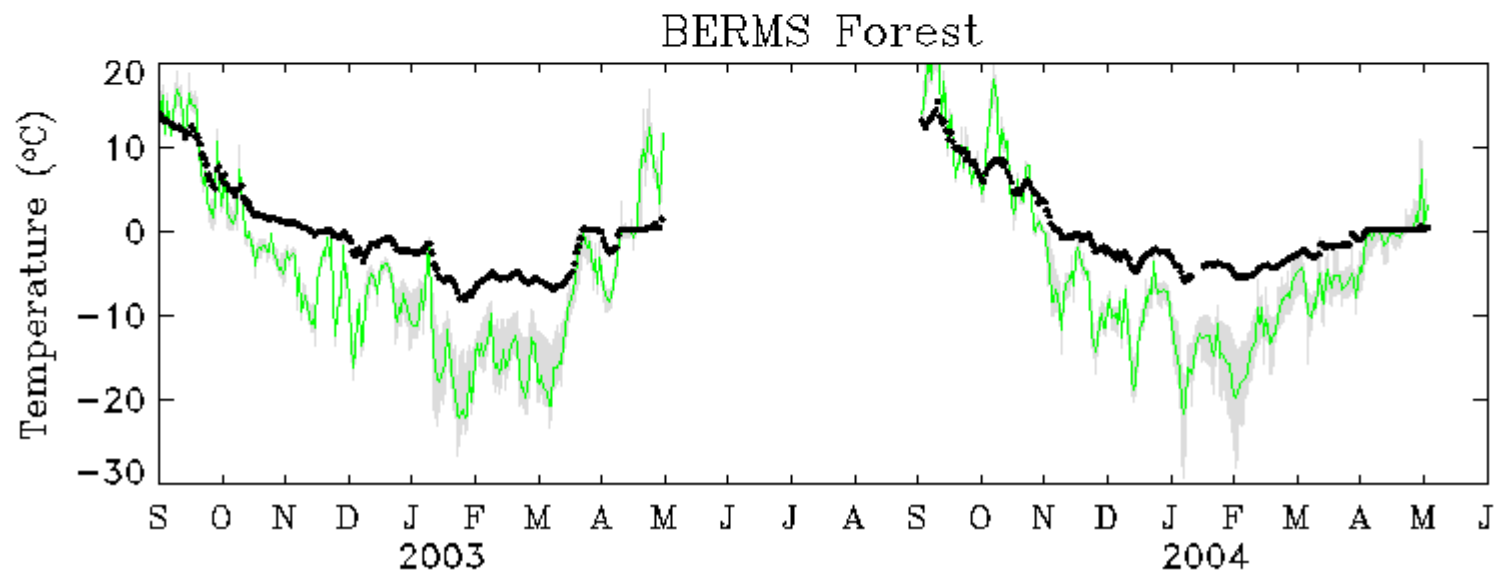
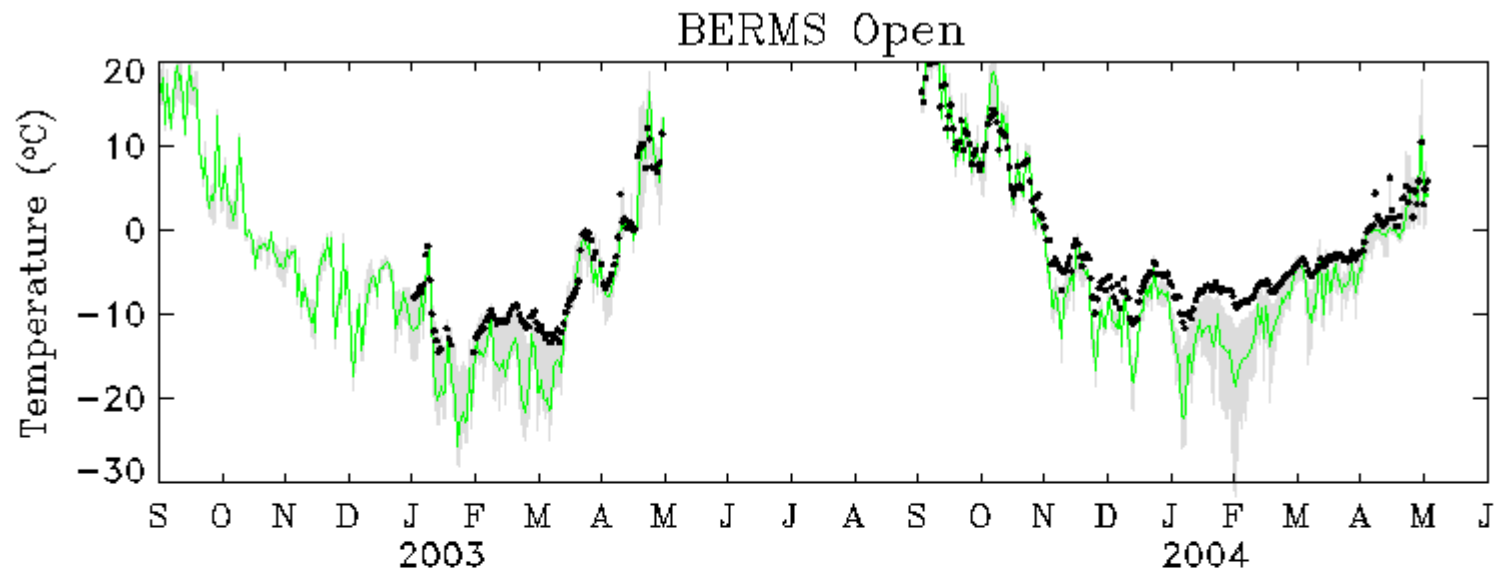
Open and Forest Surface Temperature Simulations



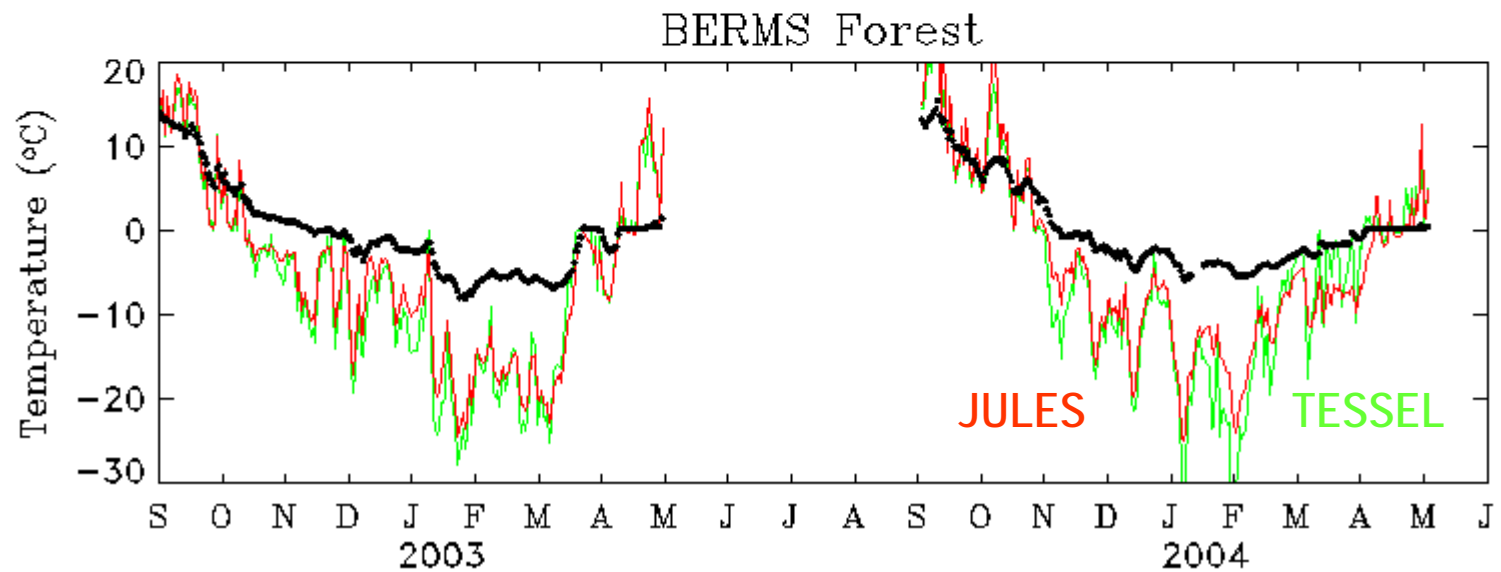
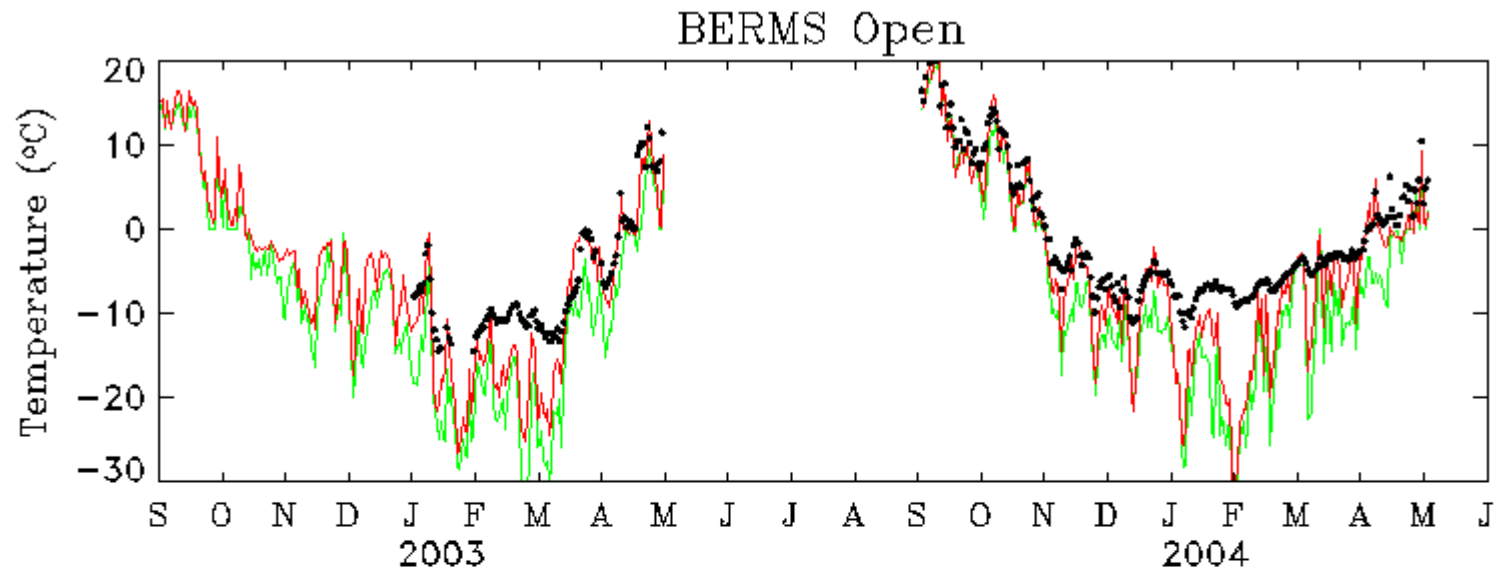
Open and Forest Soil Temperature Simulations



Open and Forest Soil Temperature Simulations



Open and Forest Soil Temperature Simulations



Concluding Remarks

Field campaigns and intercomparison projects for snow in boreal forests have been influential in the development of MOSES/JULES and TESSEL

Advantages of local, uncoupled model evaluations:

Unbiased (?) driving data

Ease of interpretation

Disadvantages:

Scale of evaluation differs from scale of application

Lack of atmospheric feedbacks

SnowMIP2 references:

Essery, RLH, and 8 others, 2009. SnowMIP2: An evaluation of forest snow process simulations. *Bull. Amer. Meteorol. Soc.*, doi: 10.1175/2009BAMS2629.1

Rutter, N, and 50 others, 2009: Evaluation of forest snow processes models (SnowMIP2). *J. Geophys. Res.–Atmos.*, doi:10.1029/2008JD011063.