Workshop on Cold Regions Hydrology

Workshop Objectives

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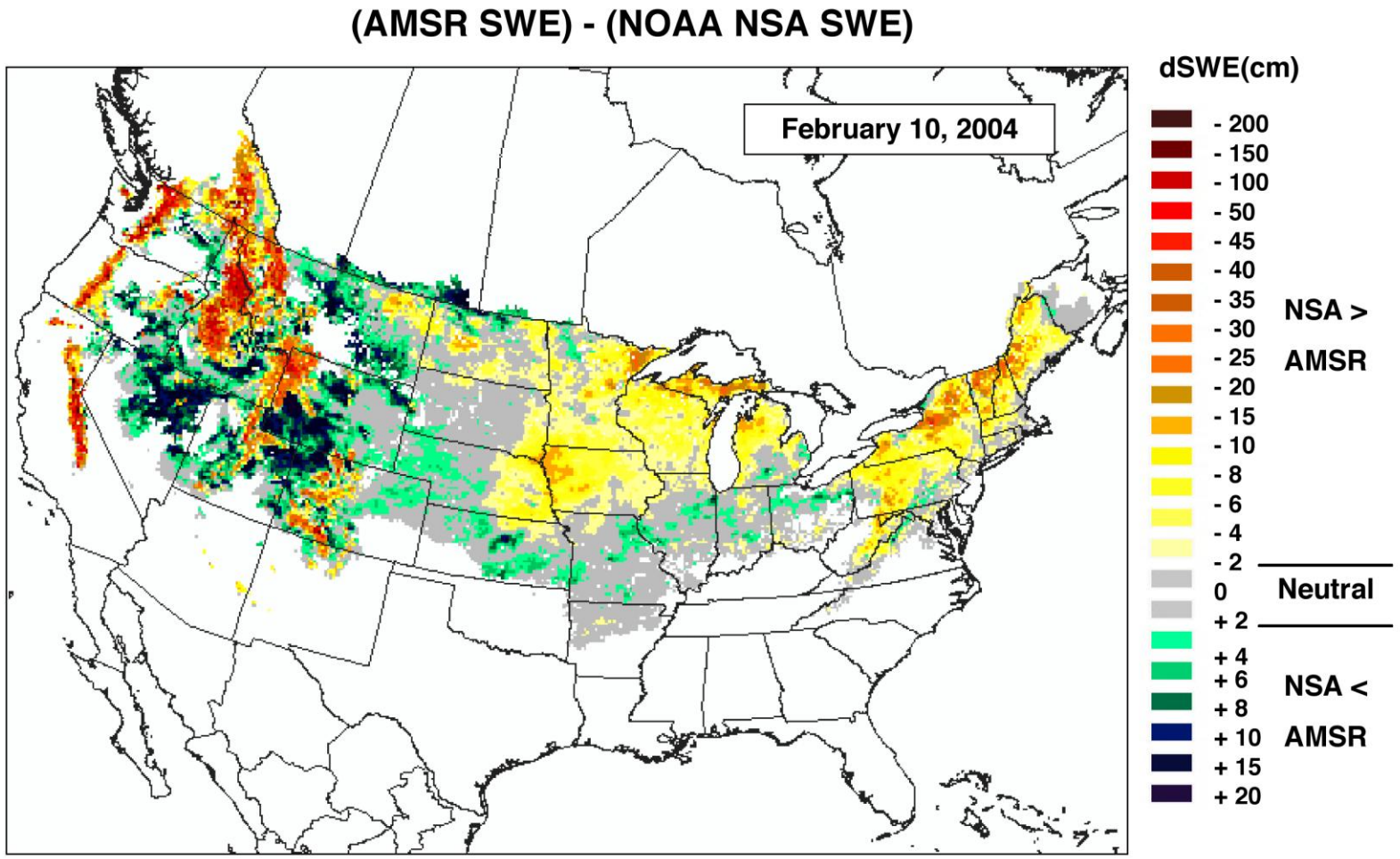
Summary of Objectives

- Specify the requirements of the scientific community for spatially distributed snow cover information
- Review and assess the ***status in observations*** (satellite-borne and in situ) ***and modelling*** of snow for applications in hydrology and climate research, and identify gaps
- Discuss and guide developments for ***integrated snow cover products*** based on cryospheric and meteorological data assimilation, models, satellite observations and in situ data
- Provide guidance for future developments in ***observation systems, data assimilation techniques and modelling***
- Prepare and advance the ***scientific and operational exploitation*** of satellite snow observations for existing and future satellite missions (CoReH$_2$O, MW radiometry, SAR, optical, & ***synergy***)

Status and Needs for Terrestrial Snow Observations (IGOS Report)

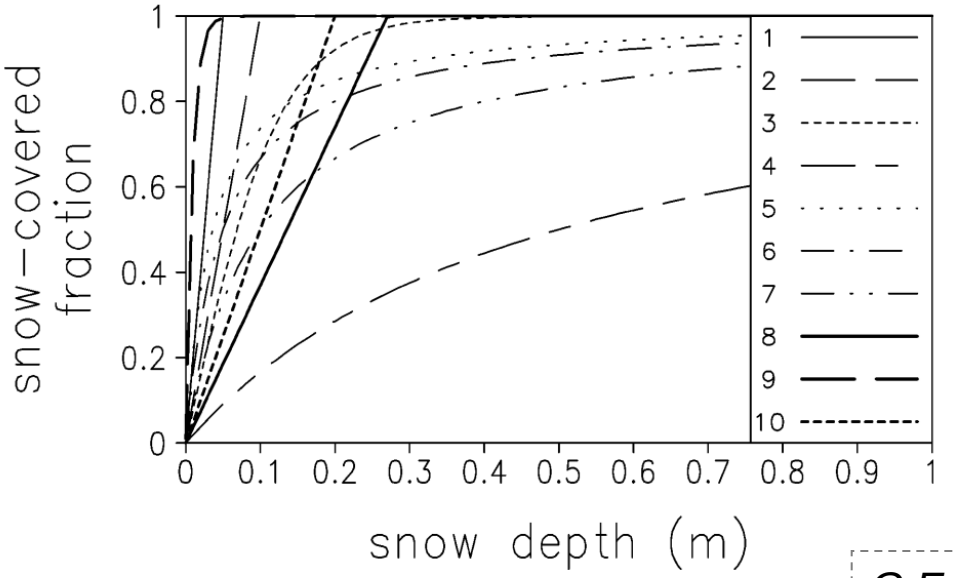
Parameter	CTO	Measurement Range			Measurement Accuracy		Resolution				Comment / Principal Driver
							Spatial		Temporal		
		L	H	U	V	U	V	U	V	U	
Snow Cover	C	20	100	%	15-20	%	1	km		day	e.g. MODIS
	T	0	100	%	10	%	0.5	km	1	day	Hydromet
	O	0	100	%	5	%	0.1	km	12	hr	
Snow Water Equivalent, satellite (Shallow)	C	0	0.2	m	2-10	cm	25	km	1	day	e.g. AMSR-E
	T	0	0.3	m	3	cm	0.5	km	6	day	Hydromet
	O	0	0.3	m	2	cm	0.1	km	12	hr	
Snow Water Equivalent, satellite (Deep)	C	None	---	---	---	---	---	---	---	---	Need HF SAR
	T	0.3	3	m	10	%	0.5	km	6	day	Hydromet
	O	0.3	3	m	7	%	0.1	km	12	hr	
Snow Water Equivalent, in situ (Shallow)	C	0	3	m	1	cm	1	m	30	day	Hydromet
	T	0	3	m	1	cm	1	m	7	day	Hydromet
	O	0	3	m	1	cm	1	m	1	day	
Snow Depth, satellite (Shallow)	C	0	~0.7	m	6-35	cm	25	km	1	day	e.g. AMSR-E
	T	0	1	m	10	cm	0.5	km	6	day	Hydromet
	O	0	1	m	6	cm	0.1	km	1	hr	Transportation
Snow Depth, satellite (Deep)	C	None	---	---	---	---	---	---	---	---	Need HF SAR
	T	1	10	m	10	%	0.5	km	6	day	Hydromet
	O	1	10	m	6	%	0.1	km	1	hr	Transportation
Snow Depth, in situ	C	0	10	m	1	cm	1	m	1	day	Hydromet
	T	0	10	m	1	cm	1	m	6	hr	Hydromet
	O	0	10	m	1	cm	1	m	1	hr	

Uncertainty in SWE : AMSR vs. Operational NSA



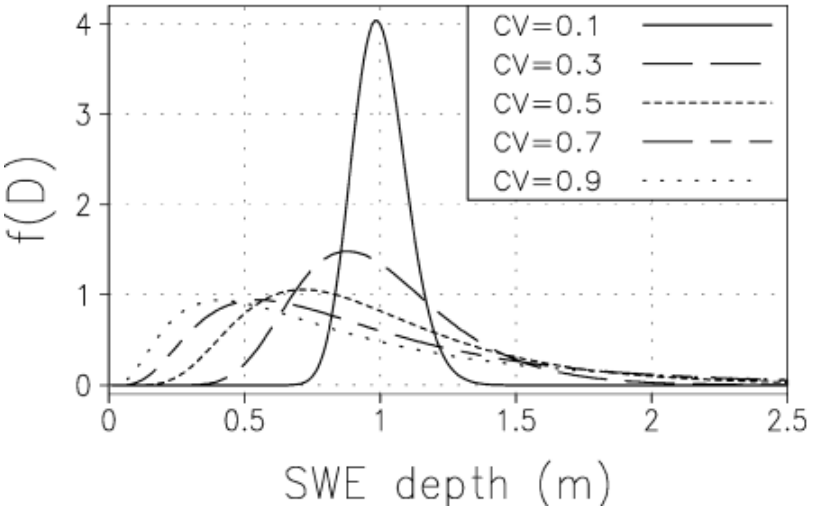
Differences between SWE observed by passive microwave radiometry (NASA's AMSR-E instrument) and SWE analysed from operational modelling and data assimilation (NOAA National Snow Analysis)

How to Represent Sub-Grid Scale Heterogenity?



G.E. Liston

Snow-covered fraction - SD relations for snow parameterisations at grid-cell scale within 10 land surface sub-models of GCMs



SWE depth functions for different coefficients of variation

⇒ Distributed SWE or SD Data to Reduce Uncertainty

Is this the way to go?

How to Advance

Discussions are very important! Please contribute actively.

Leave time for discussion at the end of your presentation.

Additional time slots for ***Thematic Discussions***:

- Snow Accumulation and Snow Processes
- Backscatter Signatures, Field Experiments, Inversion Methods
- Regional Snow Models and Data Assimilation
- Hydrological Modelling

In the ***Closing Session*** on Friday afternoon the session chairs will present a summary (based on oral and poster presentations) and on the outcome of the discussions.

Documentation of Workshop Results

- A ***workshop report*** will be prepared, including the session summaries and discussions
- The ***oral presentations and posters*** will be placed on the conference web site (pdf files), pending on permission of the author.
- Should we approach a (hydrological ?) journal for publication of workshop papers in a special issue?