PSR/A and PSR/CX AMSR-E Validation Update

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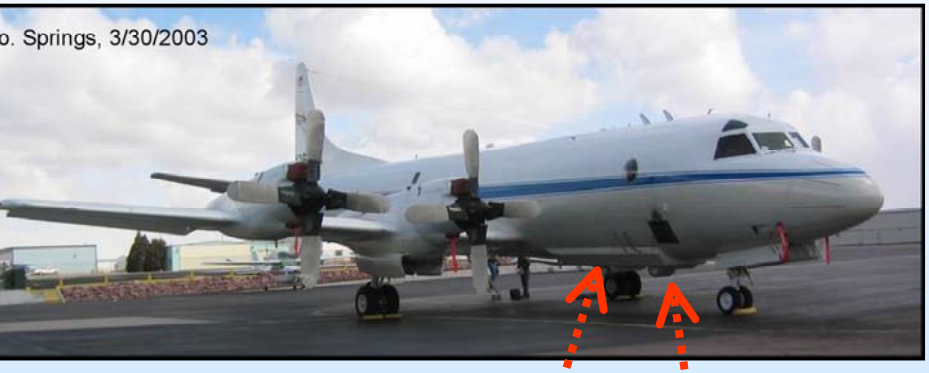
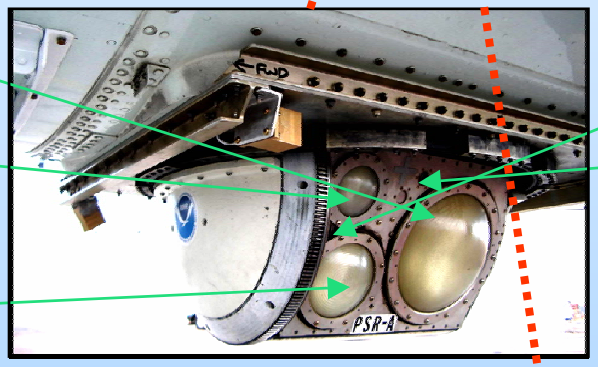
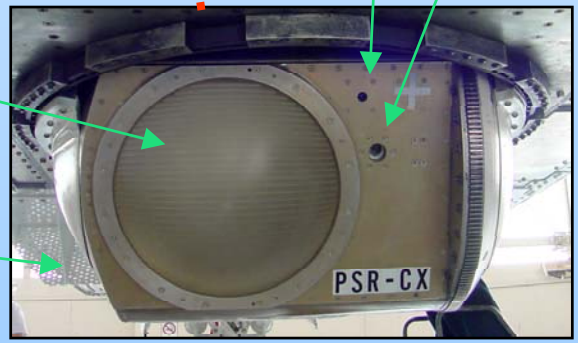
PSR Configuration for 2003 AMSR-E Validation



	WBAY	CLPX A	AMSRIce	CLPX B	SMEX	AASI
Aircraft	P-3	P-3	P-3	P-3	P-3	P-3
Scanhead	PSR/A	PSR/A	PSR/A PSR/CX	PSR/A PSR/CX	PSR/CX	PSR/ PSR/C





10.7 GHz
37.0 GHz
89.0 GHz
18.7 GHz
21.5 GHz
Video
10 μm IR
6.7 GHz
10.7 GHz
Aerodynamic Fence

PSR Radiometer System Parameters

- PSR is the first airborne multi-band conical-scanned imaging radiometer system.
- The PSR was designed for a variety of high-resolution environmental remote sensing purposes and it is uniquely suited for AMSR-E calibration and validation campaigns.
- The most recent PSR hardware improvement permits simultaneous use of multiple PSR scanheads on a single aircraft to provide imagery at all of the AMSR-E bands.

Frequency (GHz)	Scanhead	Polarization	Beamwidth[1] (°)	ΔT_{rms}[2] (K)
5.8-7.5	PSR/CX[3]	v,h,U,V	10	0.2
10.6-10.8	PSR/CX[3] PSR/A	v,h,U,V	7 8	0.4 0.6
18.6-18.8	PSR/A	v,h,U,V	8	0.3
21.4-21.7 (H_2O)	PSR/A	v,h	8	0.4
36-38	PSR/A	v,h,U,V	2.3	0.5
86-92	PSR/A	v,h,U	2.3	0.6
10 μm (IR)	PSR/A	unpolarized	7	0.2

[1] Half-power beamwidth; [2] 18 msec equivalent integration time, v & h; [3] Multiple sub-bands for interference mitigation

WBAY03 PSR Data Summary

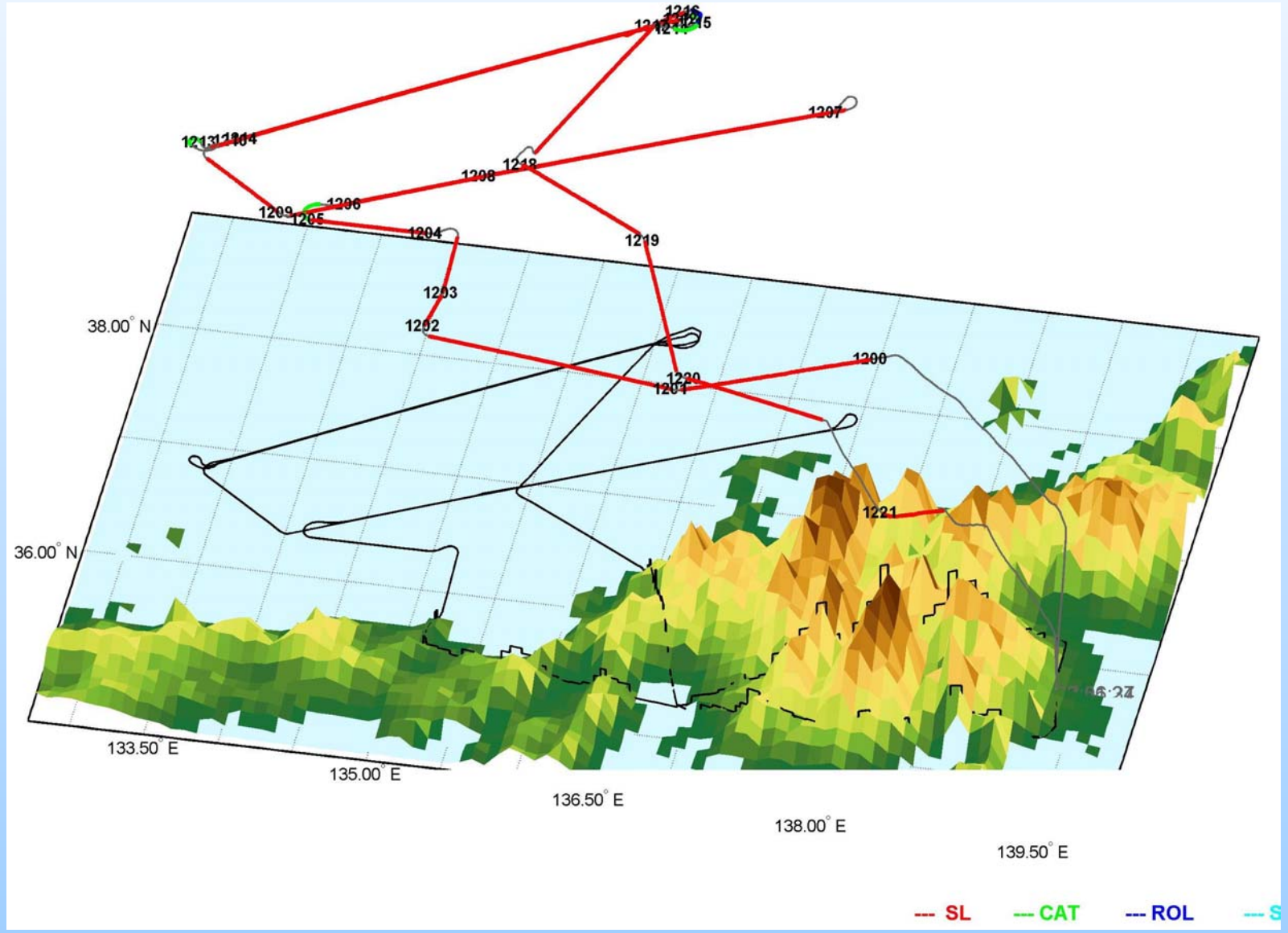
Exp. Name	Region Observed	Date	Obs. Times (UTC)	Total # of Flight Lines	%Time PSR Operated	Flight Altitude (km MSL)
WBAY03	Sea of Japan	1/14/03	02:51-09:18	1, 1	0	7, 0.15
	Honshu	1/15/03	03:03-06:49	4	80	7
	Western Pacific	1/19/03	02:58-09:52	2, 1, 1, 1, 1, 1	95	7, 5, 4, 3, 2, 0.15
	Western Pacific	1/21/03	02:05-08:26	2, 1, 1	95	7, 3, 0.15
	Western Pacific	1/23/03	06:23-10:54	2, 2	100	7, 3
	Honshu	1/26/03	03:27-04:48	4	100	7
	Sea of Japan	1/27/03	02:08-07:34	5, 1	100	7, 5
	Sea of Japan	1/28/03	02:25-08:07	5, 1	100	7, 5
	Sea of Japan	1/29/03	02:14-06:37	5, 1	100	7, 5
	Sea of Japan	1/30/03	02:06-07:19	5, 1	100	7, 5
	Honshu	2/01/03	03:14-04:31	2	100	7
	Western Pacific	2/03/03	02:00-06:24	3, 1	100	7, 0.15
	Sea of Okhotsk	2/07/03	01:05-09:08	4, 1	100	7, 4
	TOTAL		62:17	60		

Principal Investigator: Tom Wilheit, J. Comiso (2/07/2003 only)
PSR Team: A.J. Gasiewski, M. Klein, B.B. Stankov, G.A. Wick
Quicklook data can be found at http://www.etl.noaa.gov/data/psr/wbay03/

WBAY03

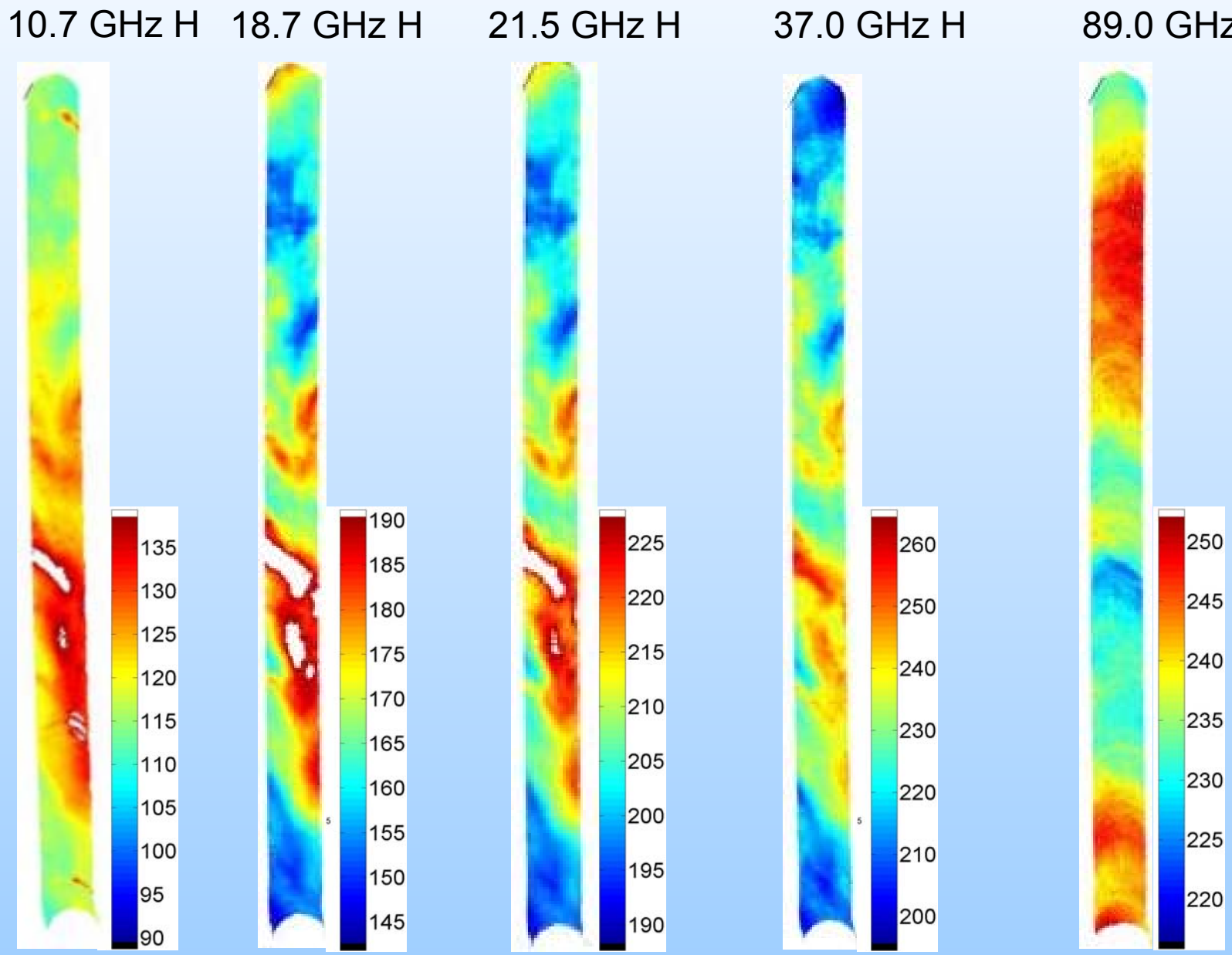
PSR/A H-pol, January 27, 2003

Fligth profile



WBAY03

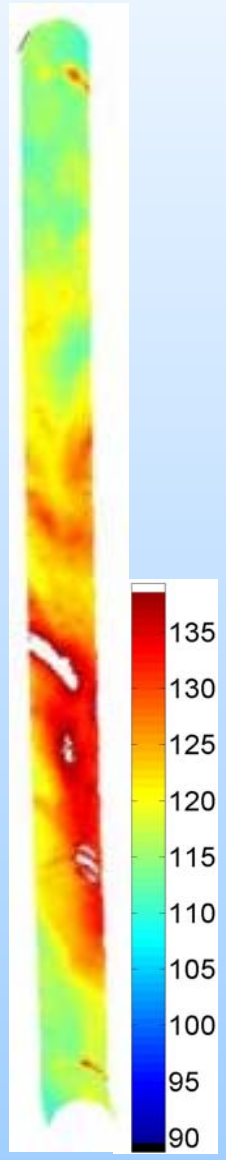
PSR/A H-pol, January 27, 2003



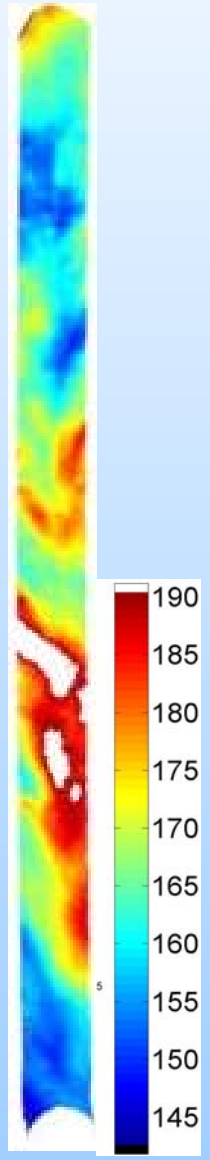
WBAY03

PSR/A H-pol, January 27, 2003

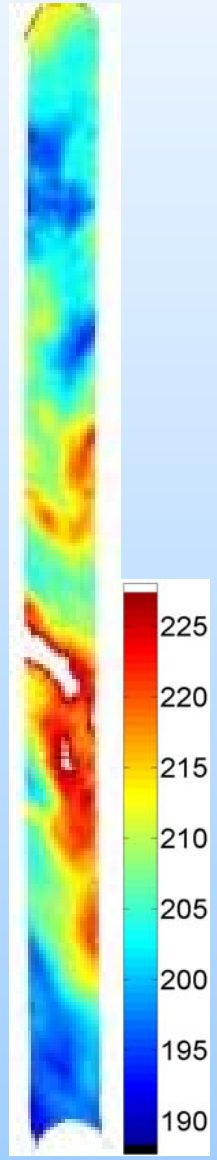
10.7 GHz H



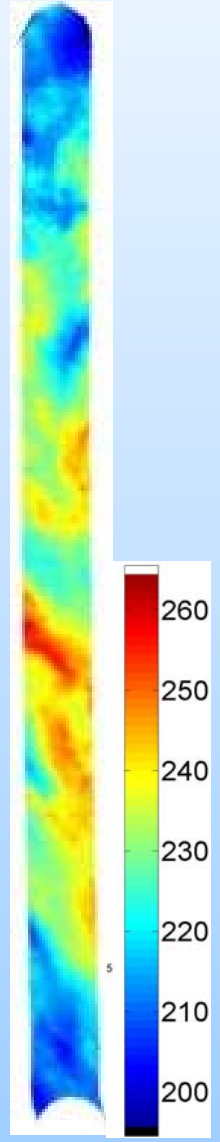
18.7 GHz H



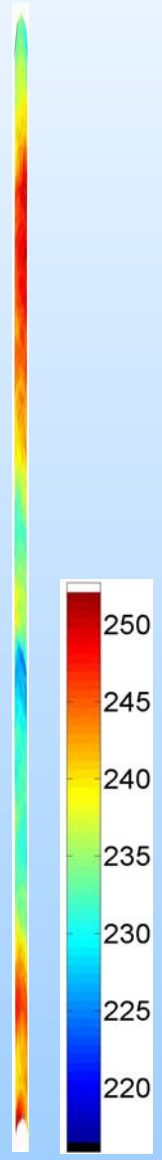
21.5 GHz H



37.0 GHz H



89.0 GHz H



CLPX03 PSR Data Summary

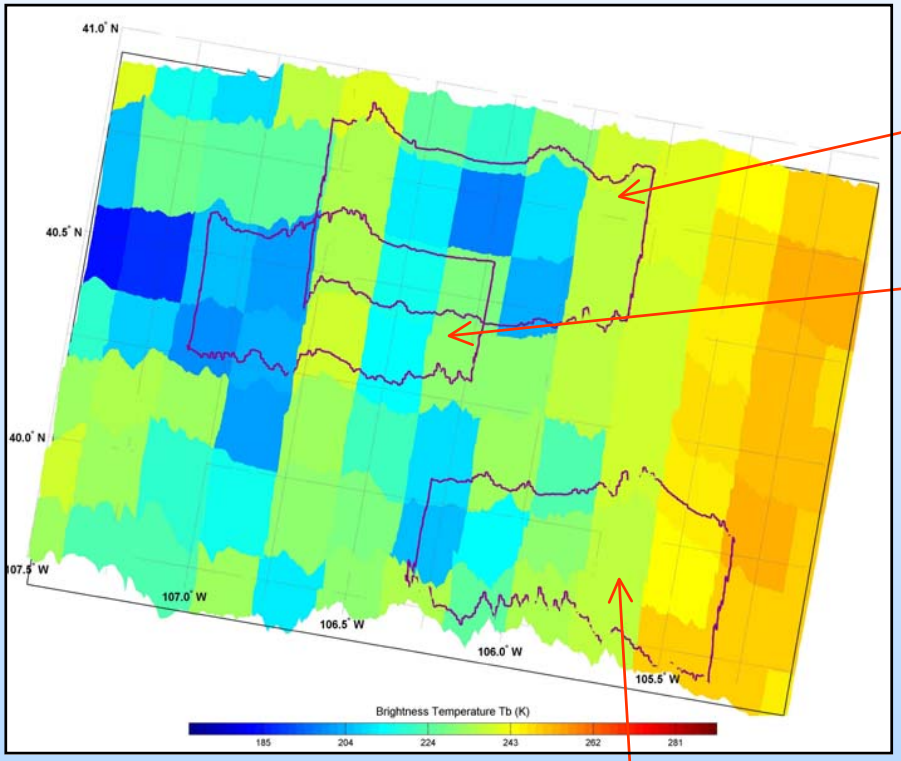
Exp. Name	Region Observed	Date	Obs. Times (UTC)	Total # of Flight Lines	%Time PSR Operated	Flight Altitude (km AGL)	3 dB Spatial Resolution Range (m) @ 37, 89 / 10, 18, 21 GHz
CLPX03A	NP	2/22/03	18:05-20:59	7	100	3.93	184 / 642 – 334/1161
	NP, RE, FM	2/23/03	17:00-21:43	21	100	2.18	65 / 229 – 215/749
	NP, RE	2/24/03	19:57-23:25	14	100	2.22	71 / 246 – 206/718
	NP, RE, FM	2/25/03	16:56-21:16	21	100	2.18	65 / 229 – 215/749
CLPX03B	NP, RE, FM	3/25/03	17:26-22:18	21	100	2.18	65 / 229 – 215/749
	NP, RE, FM	3/30/03	17:50-22:41	21	100	2.18	65 / 229 – 215/749
	NP, RE, FM	3/31/03	17:48-22:00	21	100	2.18	65 / 229 – 215/749
	Total		**29:30**	**126**			

NP = North Park, RE = Rabbit Ears, FM = Fraser Meadows

Principal Investigator: Don Cline
PSR Team: A.J. Gasiewski, B.B. Stankov, B.L. Weber
Quicklook data can be found at http://www.etl.noaa.gov/data/psr/clpx03/

AMSR-E 37 GHz H-Pol T_B Imagery

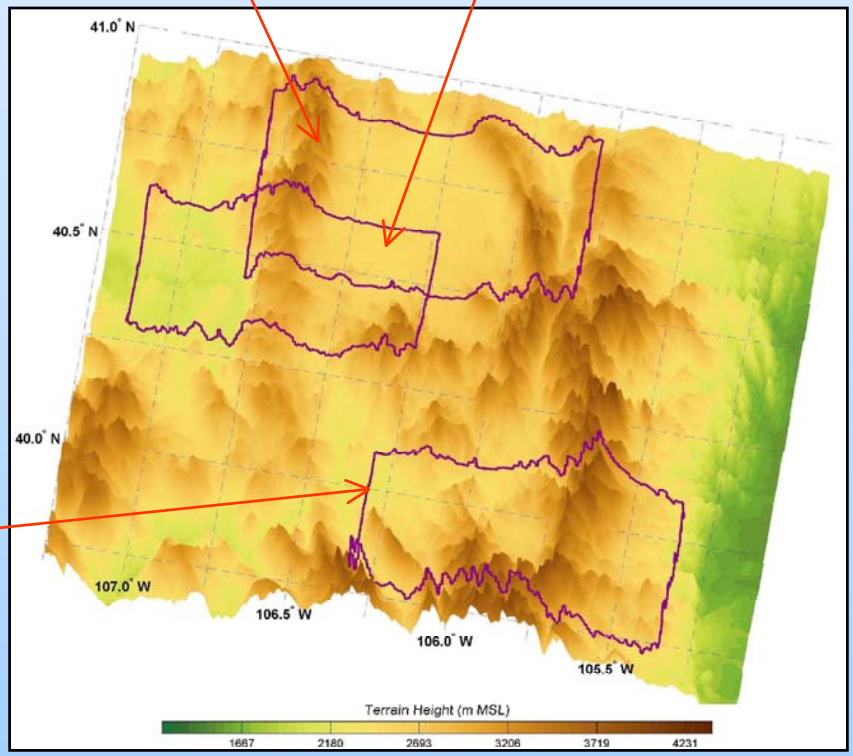
- February 23, 2003 CLPX03A -



North Park

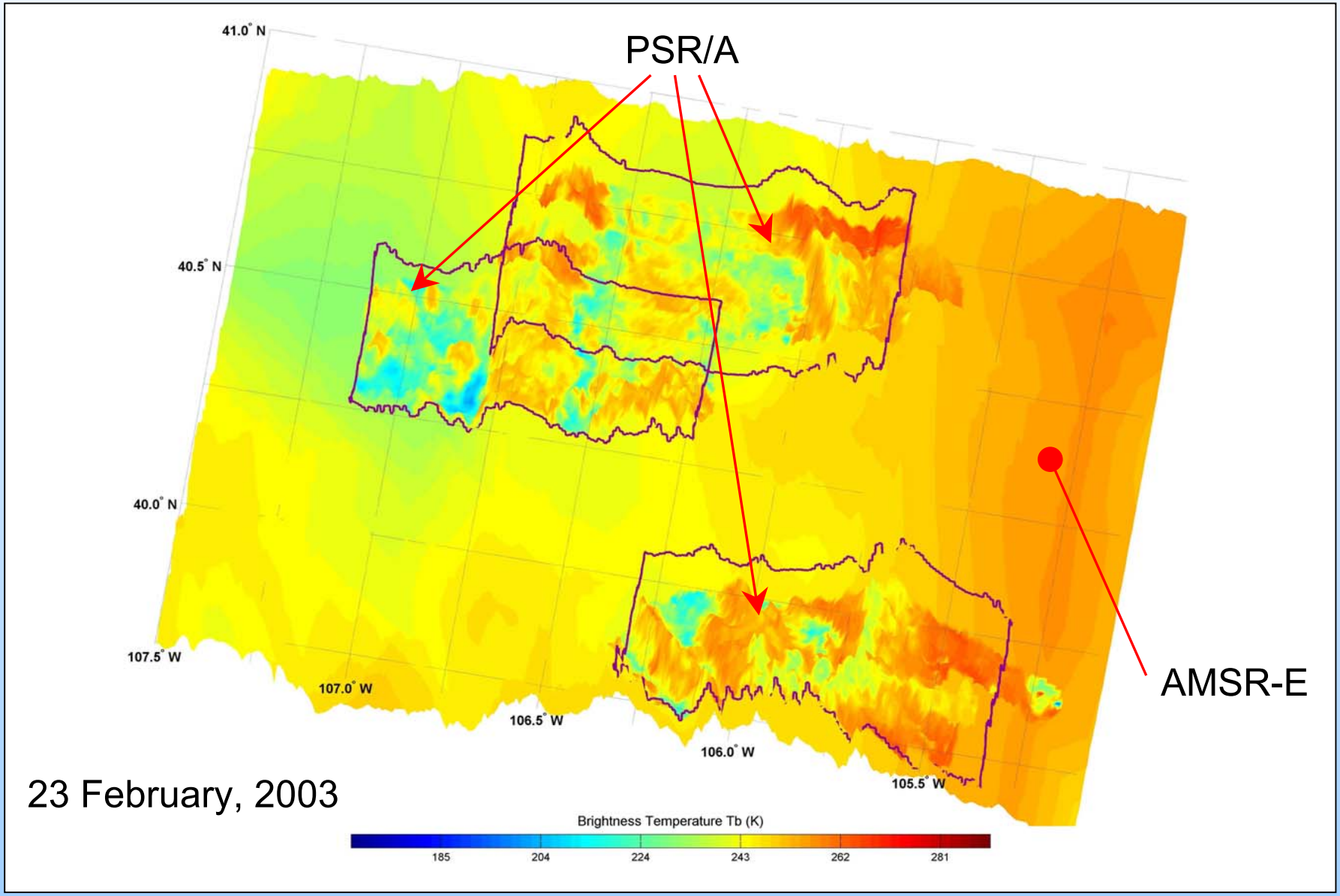
Rabbit Ears

Fraser Meadows



AMSR-E to PSR/A T_B Intercomparison

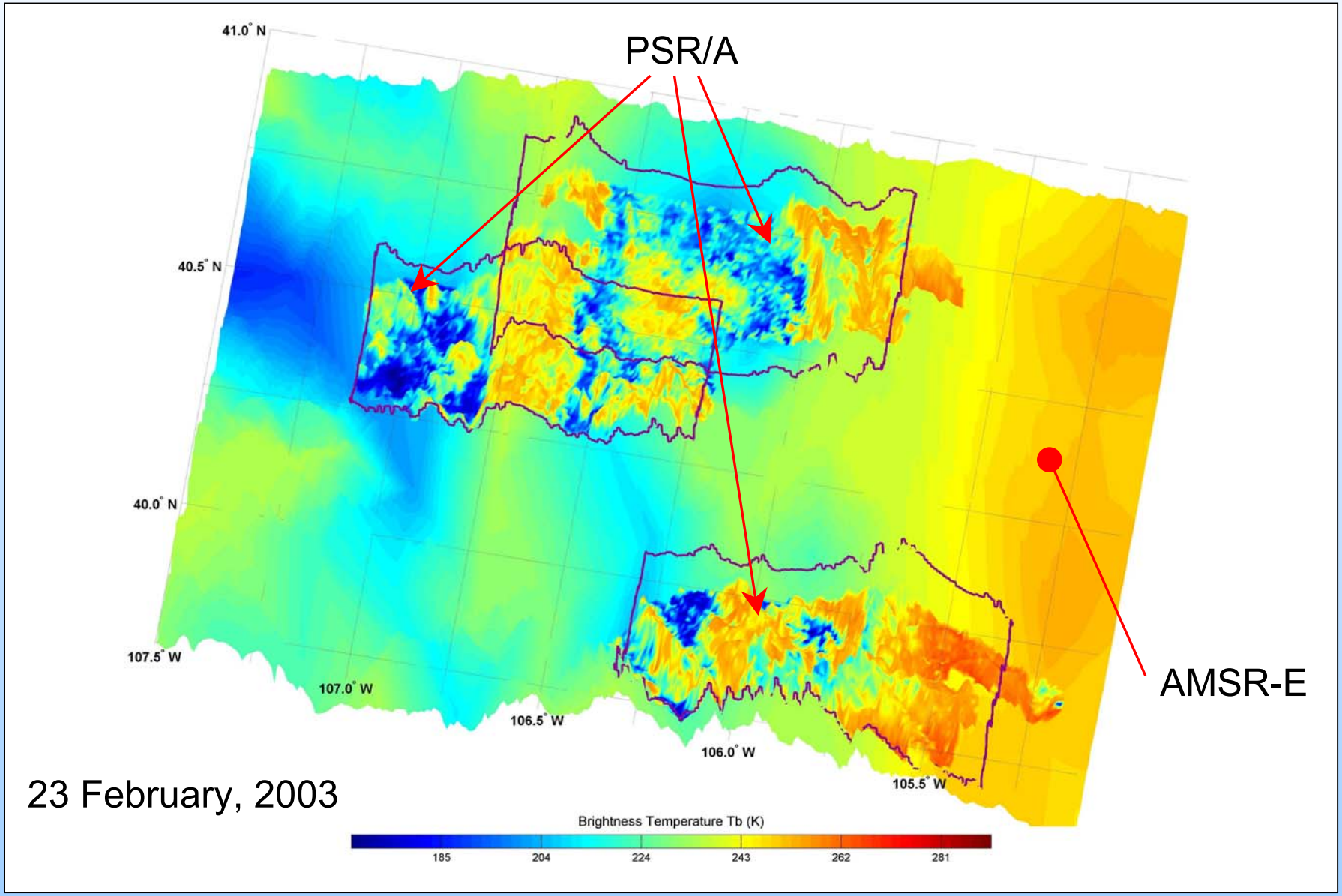
- 18.7 GHz H-pol -



23 February, 2003

AMSR-E to PSR/A T_B Intercomparison

- 37.0 GHz H-pol -



Snow Water Equivalent

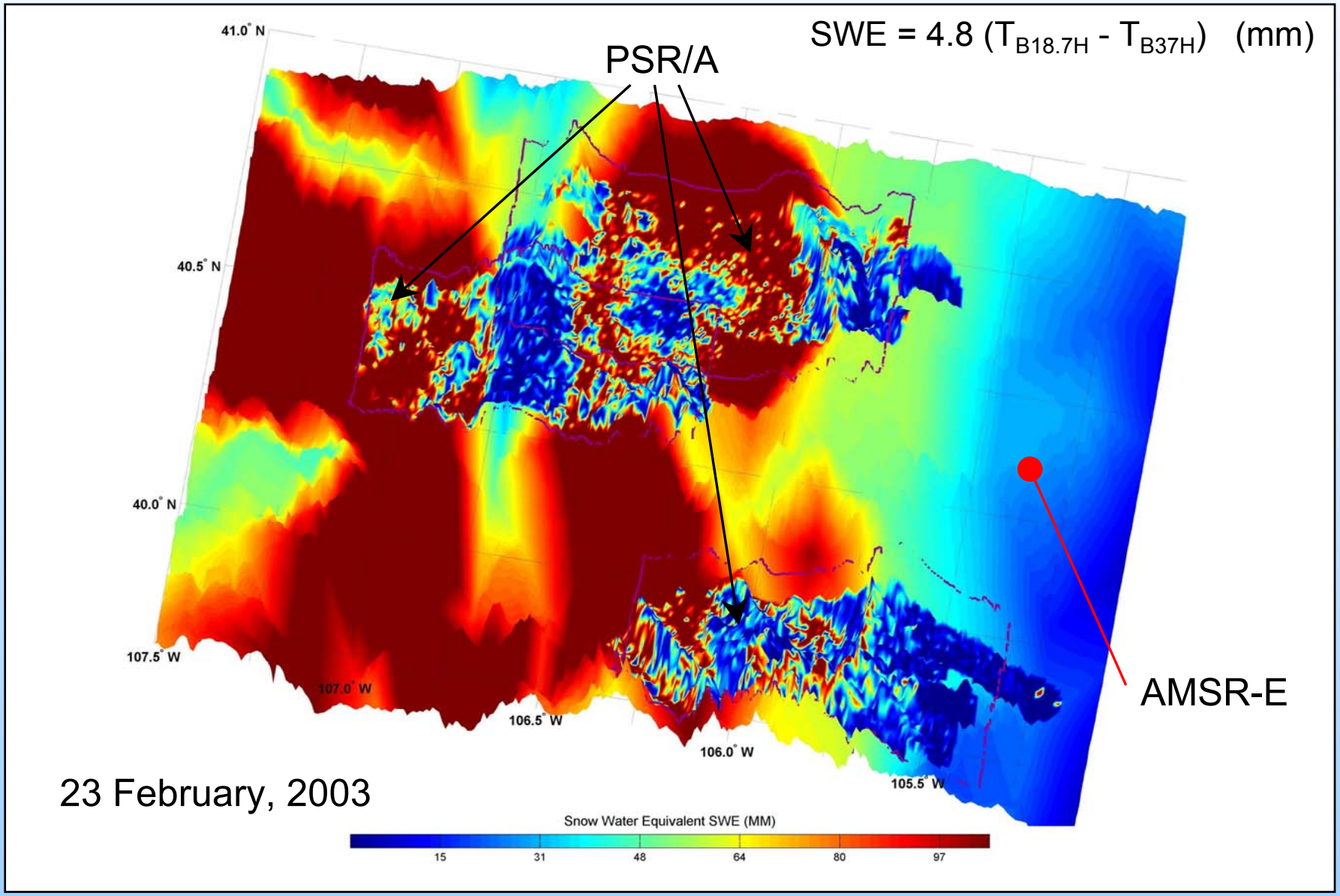
Scattering from ice particles decreases observed brightness temperatures for higher frequency channels relative to lower frequencies. This concept is the basis for the conventional estimate of snow water equivalent (SWE):

$$SWE = 4.8\ (T_{B18.7H} - T_{B37H}) \quad (mm)$$

Chang, A.T. C., J.L. Foster and D.K. Hall, “Nimbus-7 derived global snow cover parameters,” Annals of Glaciology, vol. 9, pp. 39-44. 1987.

AMSR-E to PSR/A Intercomparison

- SWE Product -



AMSRIce03 PSR Data Summary

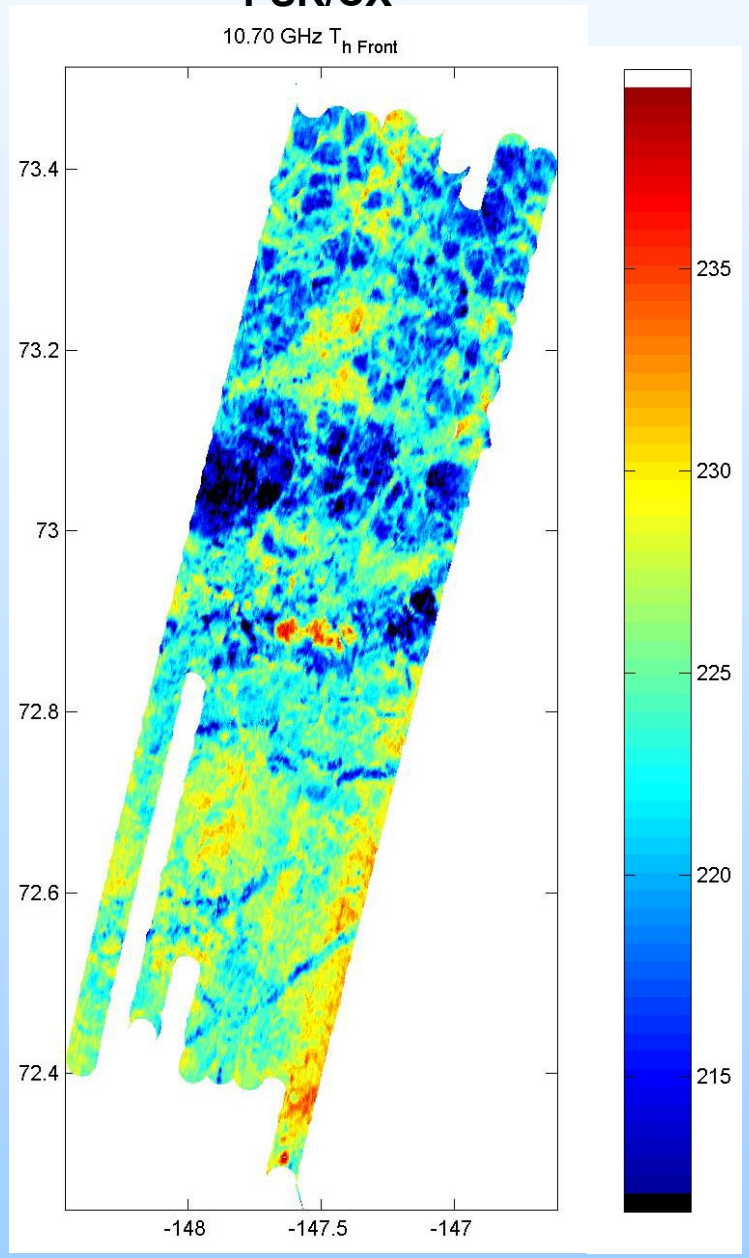
Exp. Name	Region Observed	Date	Obs. Times (UTC)	Total # of Flight Lines	%Time PSR Operated	Flt. Alt. (km MSL)	Spatial Resolution (km) @ 37, 89 / 18, 21 / 10, 6 GHz
AMSRIce03	Barrow, AK	3/13/03	18:07-00:40	18, 6	100	0.15, 1	0.09/ 0.32/ 0.26, 0.4, 0.01/ 0.05/ 0.04, 0.06
	Norton Sound	3/15/03	18:24-00:06	10	100	1.3	0.12/ 0.42/ 0.34, 0.52
	St. Lawrence Island	3/16/03	18:21-01:49	16, 2	99	0.15, 1.3	0.09/ 0.32/ 0.26, 0.4, 0.12/ 0.42/ 0.34, 0.52
	St. Mathews Island	3/18/03	17:21-23:50	6	98	1.3	0.12/ 0.42/ 0.34, 0.52
	Baufort Sea, Barrow, AK	3/19/03	18:27-01:06	12	98	1.3	0.12/ 0.42/ 0.34, 0.52
	Point Hope, AK	3/20/03	18:06-23:25	8	100	1.3	0.12/ 0.42/ 0.34, 0.52
	St. Mathews Island, Kuskokwin Bay	3/22/03	17:43-01:20	7, 3, 2, 2	100	1.3, 0.15, 0.23, 0.30	0.09/ 0.32/ 0.26, 0.4, 0.12/ 0.42/ 0.34, 0.52
	Total		**45:47**	**92**			

Principal Investigator: Don Cavalieri, Thorsten Markus
PSR Team: A.J. Gasiewski, V. Irisov, M. Klein
Quicklook data can be found at http://www.etl.noaa.gov/data/psr/ak03/

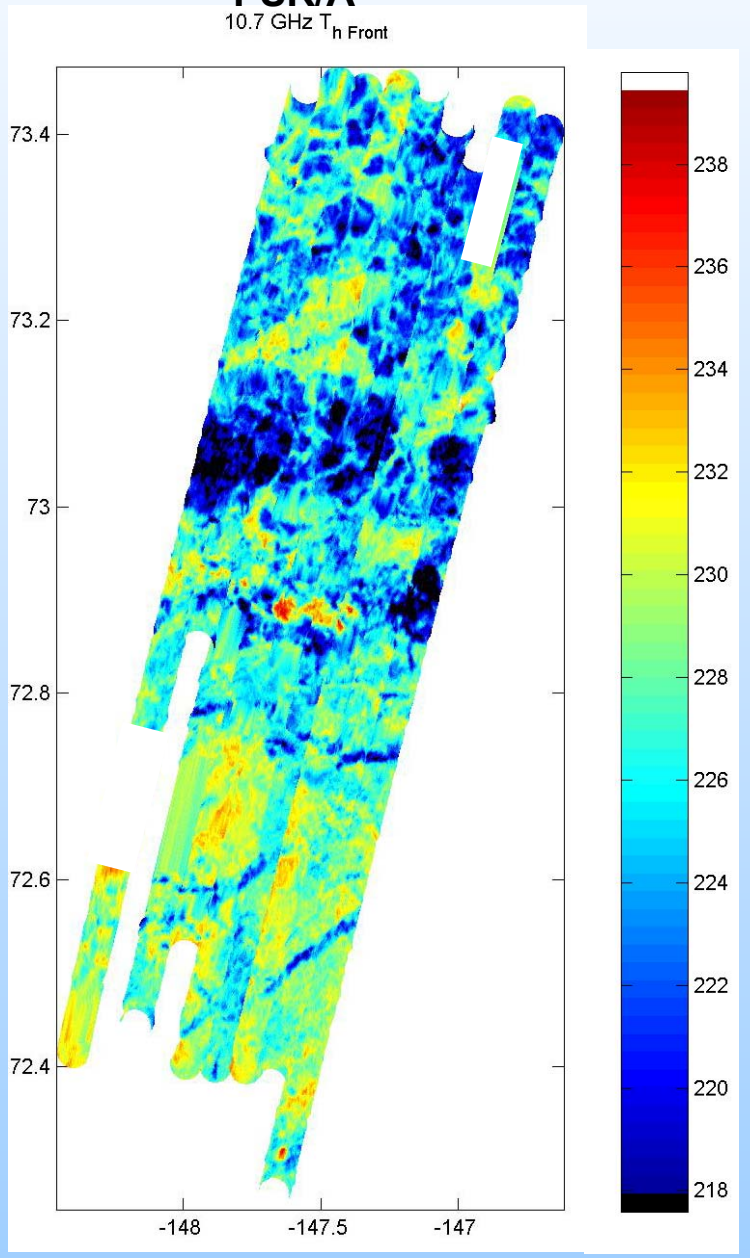
PSR/CX to PSR/A T_B Intercomparison

10.7 GHz H-pol, March 19, 2003

PSR/CX



PSR/A

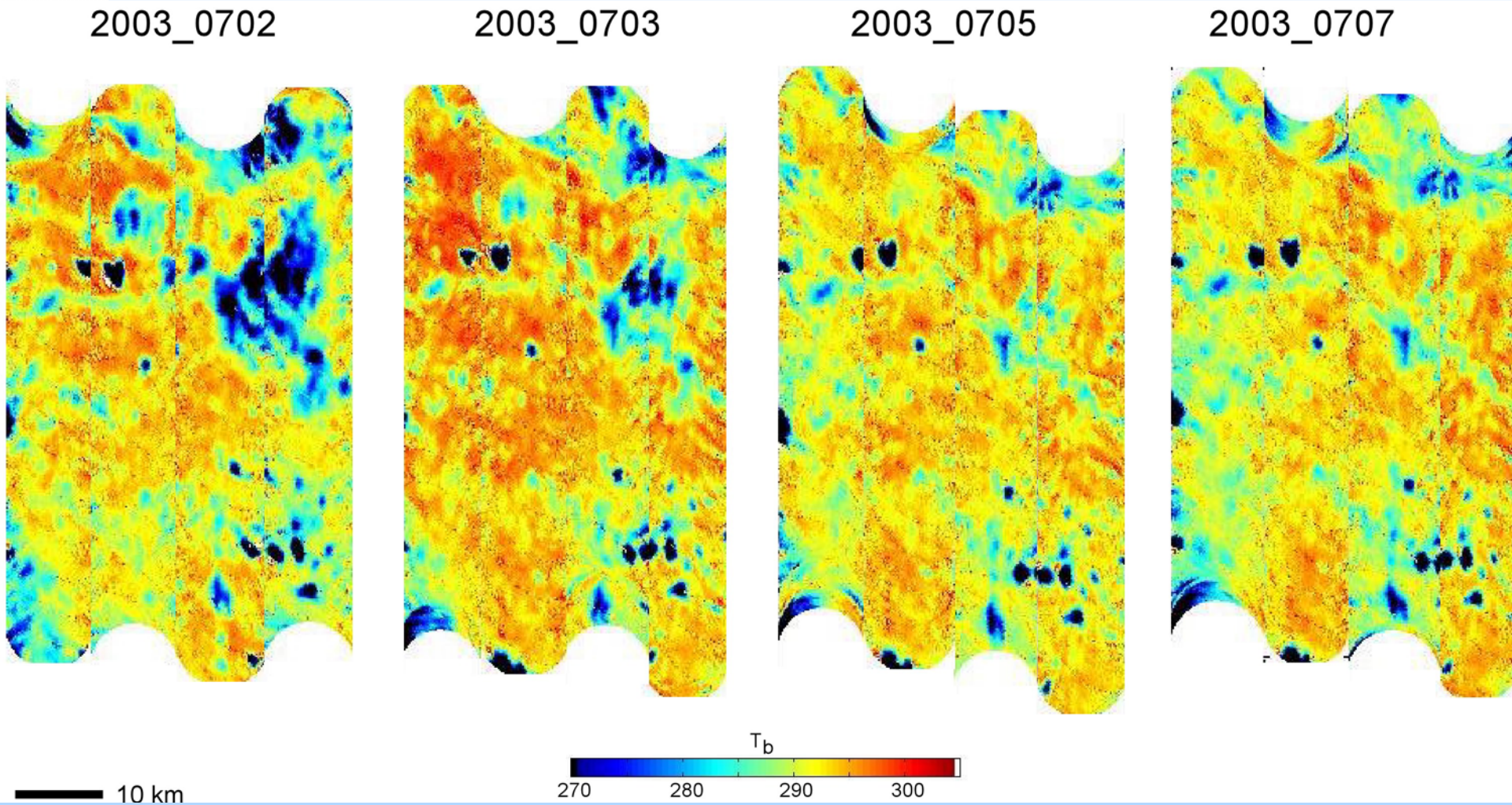


SMEX03 PSR Data Summary

Exp. Name	Region Observed	Date	Observation Times (UTC)	Total # of Flight Lines	%Time PSR Operated	Flight Altitude (km)
SMEX03	Georgia, Alabama	6/25/03	17:52-22:32	8	100	7
	Alabama	6/27/03	20:45-22:45	4	100	7
	Alabama	6/29/03	15:58-19:37	4	100	7
	Alabama	6/30/03	14:02-17:47	4	100	7
	Alabama, Oklahoma	7/2/03	15:23-20:22	9	100	7
	Oklahoma	7/3/03	15:52-19:15	12, 1	100	7, 1
	Oklahoma	7/5/03	15:43-19:01	12, 1	100	7, 1
	Oklahoma	7/7/03	15:47-18:58	12, 1	100	7, 1
	Oklahoma	7/10/03	16:04-19:30	12, 1	100	7, 1
	Oklahoma	7/11/03	15:48-17:20	4, 1	100	7, 1
	Oklahoma	7/12/03	15:50-18:33	8, 1	100	7, 1
	Oklahoma	7/13/03	15:45-18:27	8, 1	100	7, 1
	Oklahoma	7/14/03	15:42-18:15	8, 1	100	7, 1
	Oklahoma	7/15/03	15:58-18:36	8, 1	100	7, 1
	Oklahoma	7/17/03	18:16-21:31	12, 1	100	7, 1
	Total		**47:55**	**135**		

Principal Investigator: Tom Jackson
PSR Team: A.J. Gasiewski, M. Klein, B.B. Stankov
Quicklook data can be found at http://www.etl.noaa.gov/data/psr/smex03/

SMEX05 10.7 GHz H-pol
Little Washita, Oklahoma



- 10.7 GHz H-pol provides reasonable sensitivity for low vegetation cover
- Drydown from isolated precipitation event observed over five days
- Precipitation footprint features observed from ~2-15 km scales
- Some “quasi-persistent” features suspected to be result of irrigation

Future Plans

- SMEX Brazil 03
- SMEX04/NAME (WB-57F)
- AASI 04
- 1st sweep calibration and data delivery
- 2nd sweep calibration

Summary

- Year 2003 – “Golden Year” for airborne microwave radiometry
- PSR system recorder over 186 data hours of high resolution passive microwave imagery within the AMSR-E channels
- Spatial resolution of order of meters (1-1000) enable us to observe phenomena never seen before
- 1st sweep calibration in progress, 2nd sweep will be necessary