AMSR-E Soil Moisture Algorithm and Validation

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Awaji Island Japan

Evaluation of AMSR-E data quality relevant to soil moisture

- TMI vs. AMSR-E channel comparisons
- 6.9 GHz vs. 10.7 GHz
- EORC vs. Wentz calibrations
- 6.9 GHz RFI (Iowa, Oklahoma)

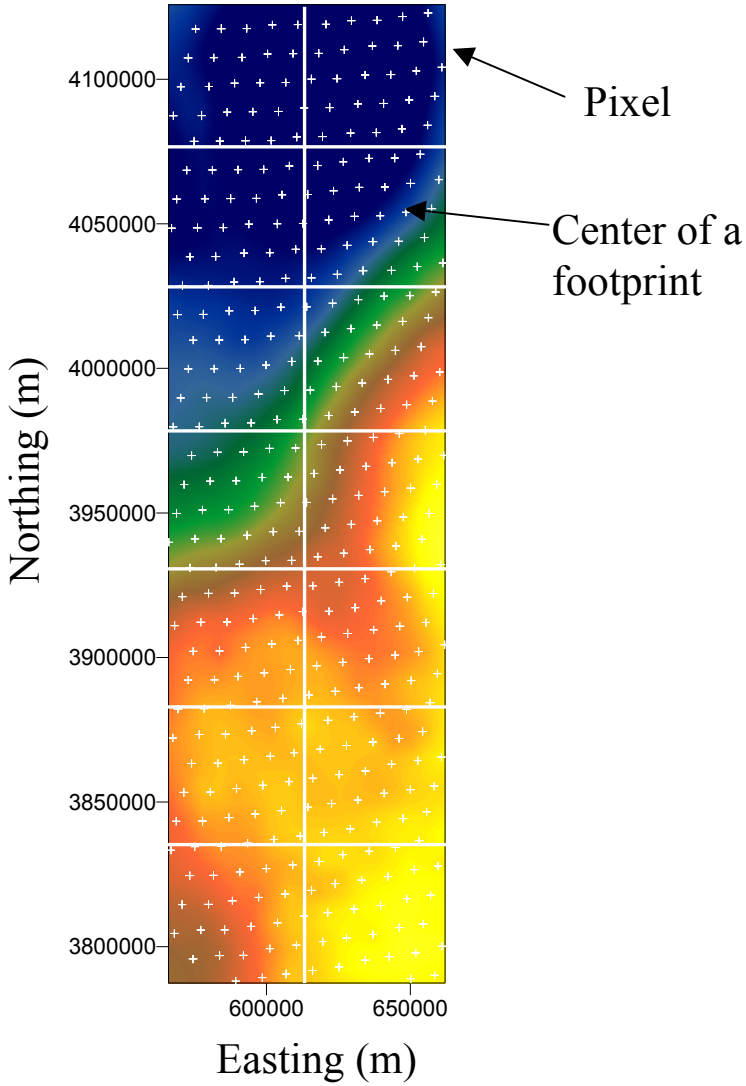
TMI vs. AMSR-E channel comparisons

- **Criteria for data selection: TMI data within 16 min of AMSR-E (EORC)**
- **Oklahoma (Time in GMT)**

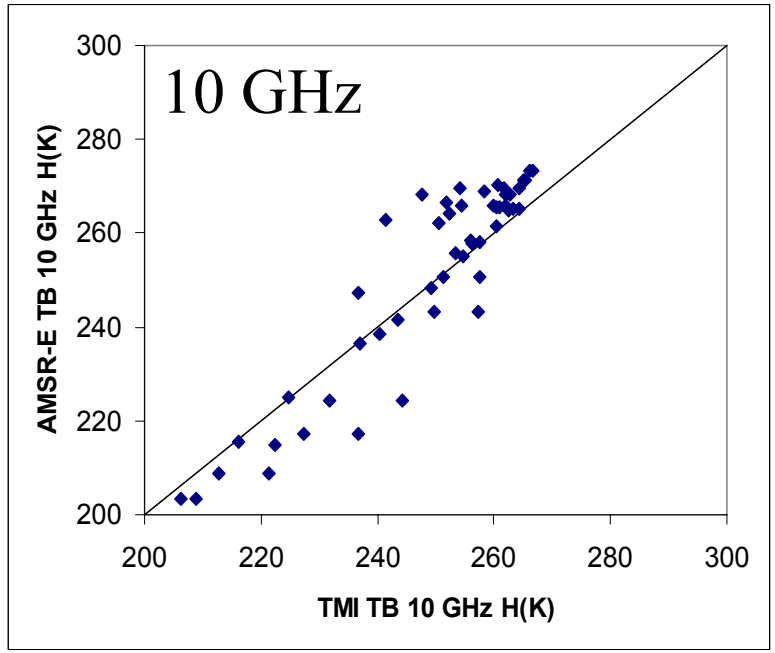
Day	AMSR-E	TMI
Oct. 4	8:39	8:26
Oct. 6	8:27	8:13
Oct. 8	8:14	8:00
Oct. 10	8:02	7:46

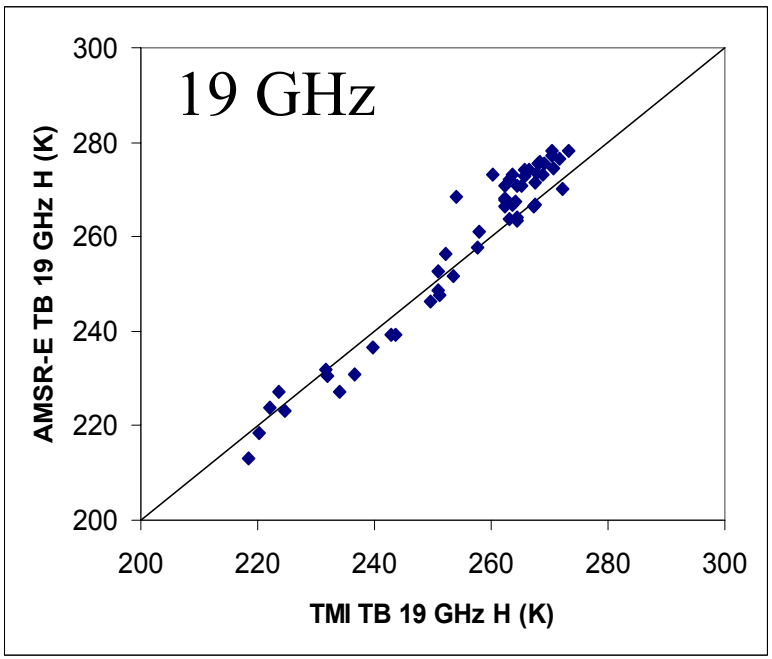
TMI vs. AMSR-E Data Set

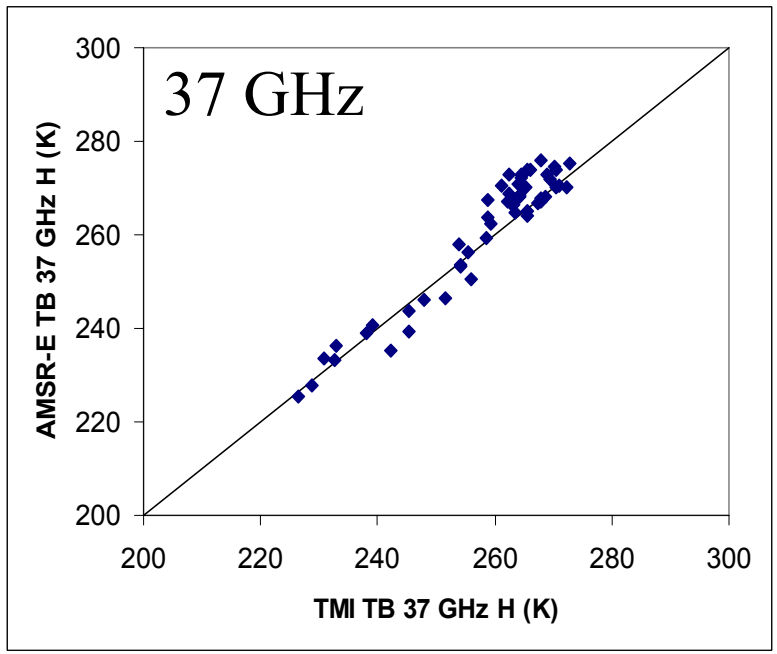
- ~100 km by 350 km region
- 48 km pixels
- Original data is interpolated and re-gridded and then averaged
- 14 pixels per day



TMI and AMSR-E H Channel Comparisons







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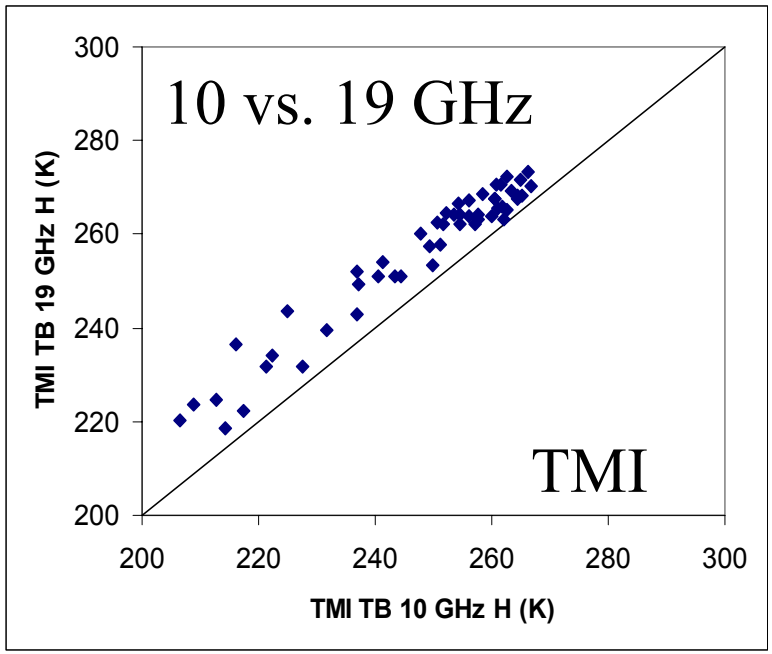
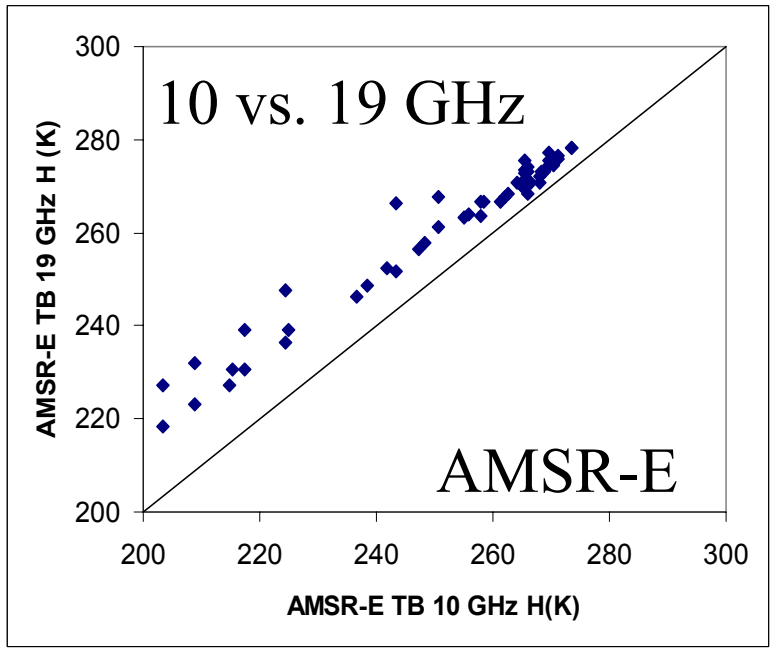
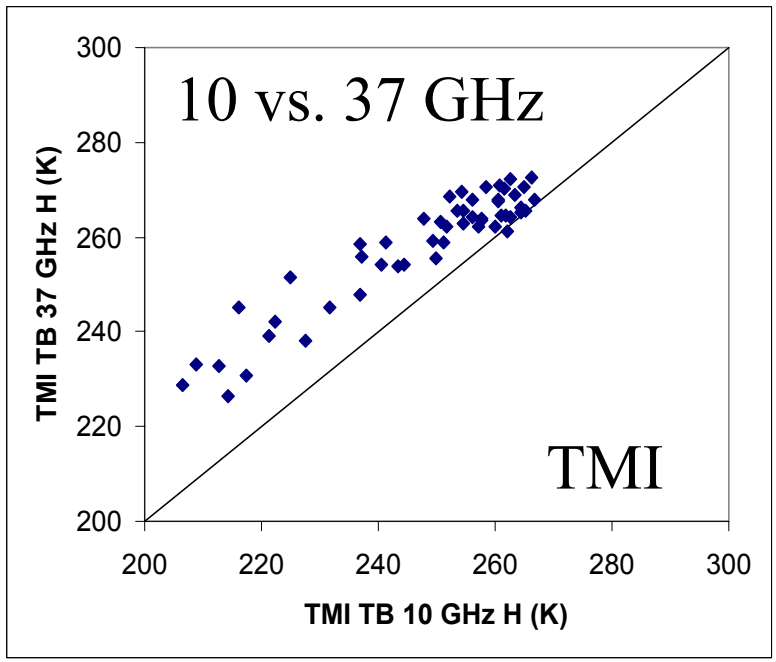
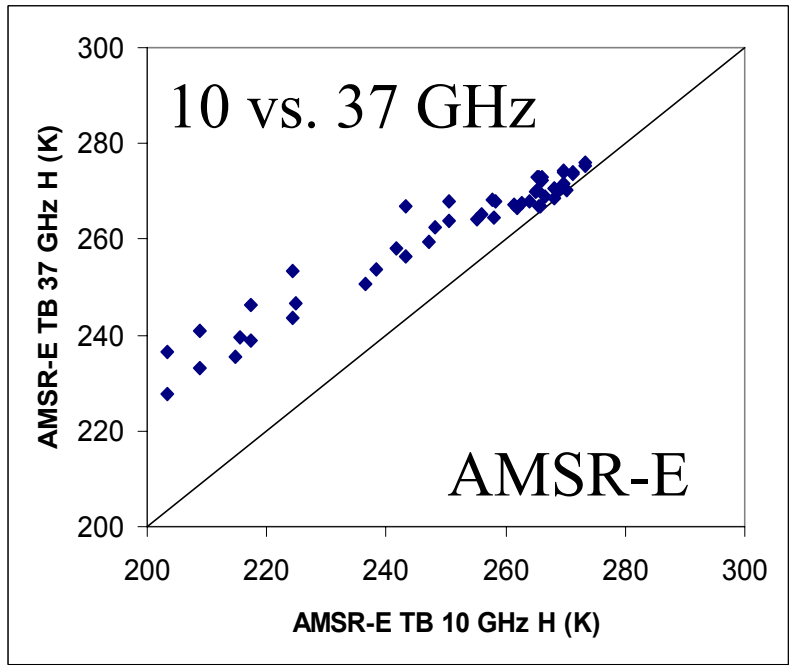


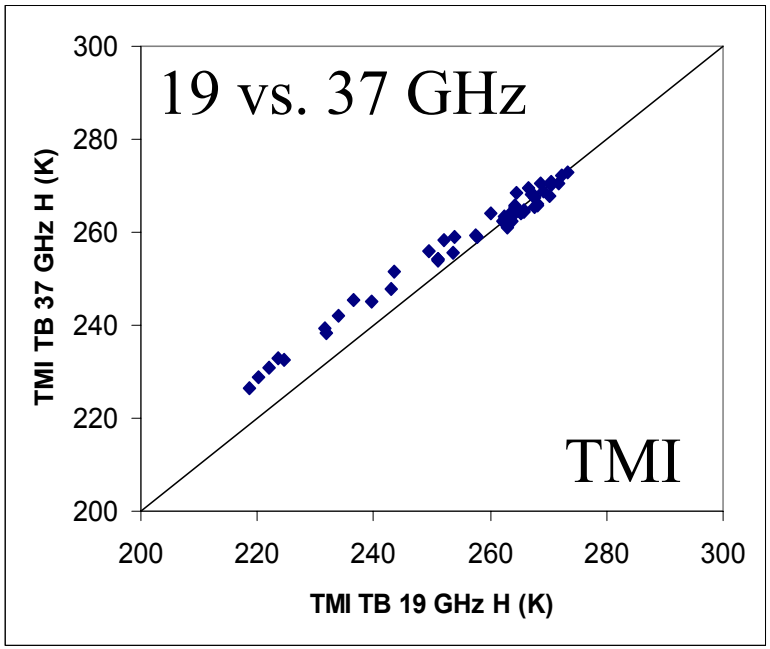


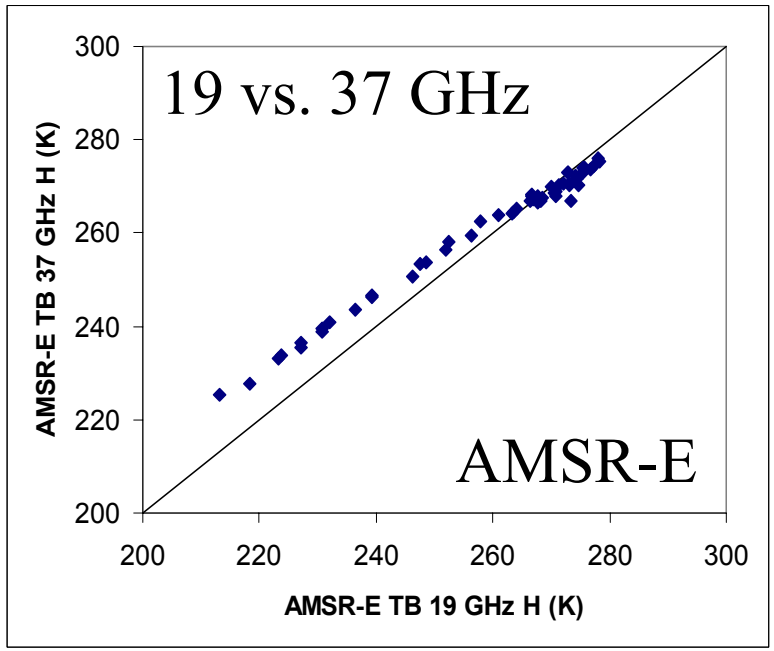
TMI and AMSR-E H Channel Comparisons



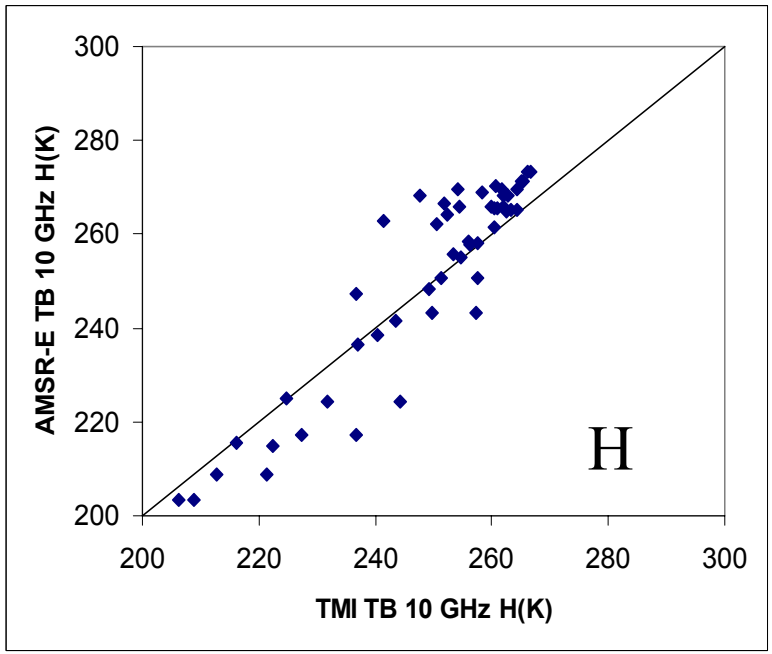


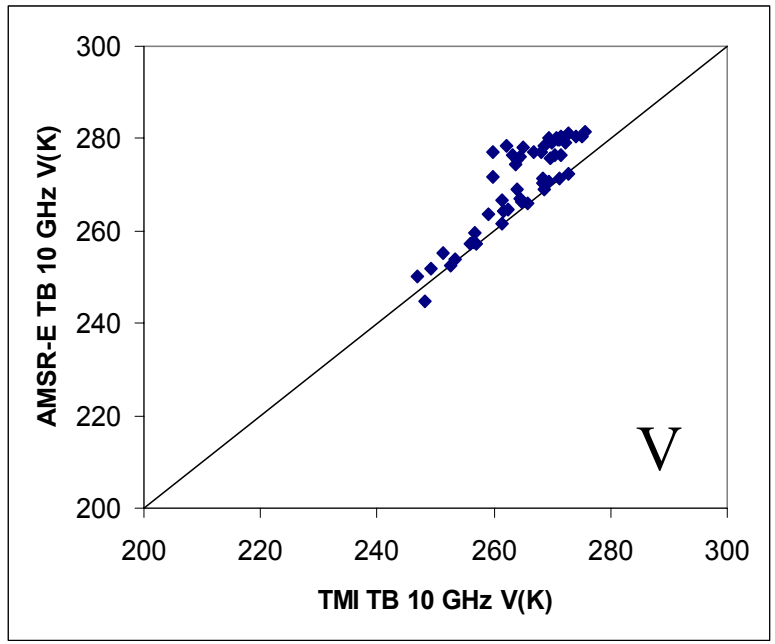
TMI and AMSR-E H Channel Comparisons



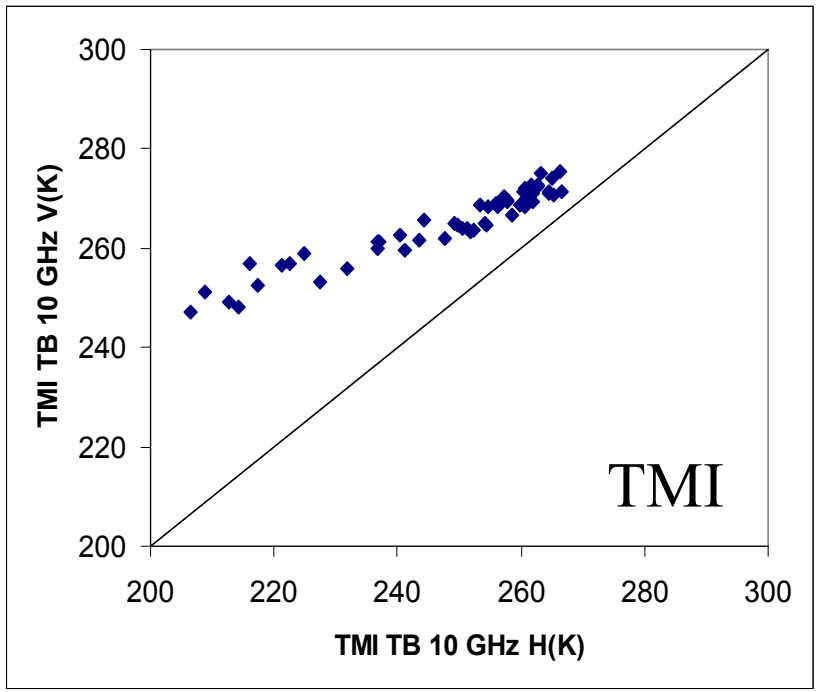


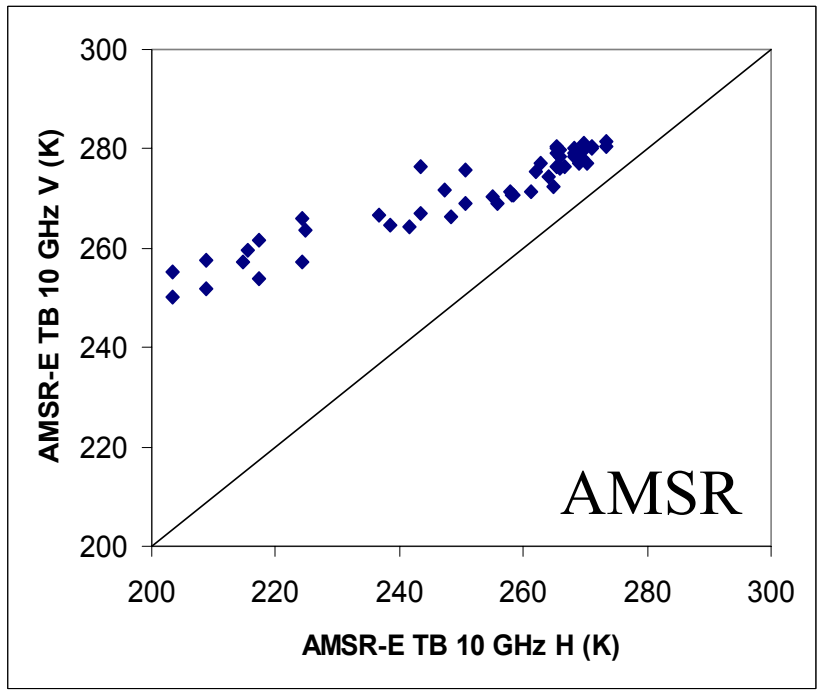
TMI and AMSR-E 10 GHz Channel Comparisons



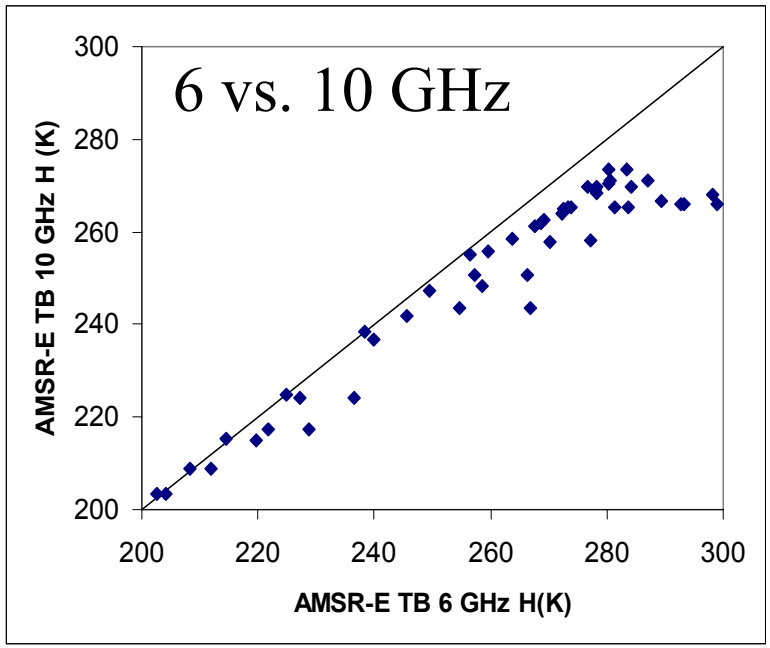


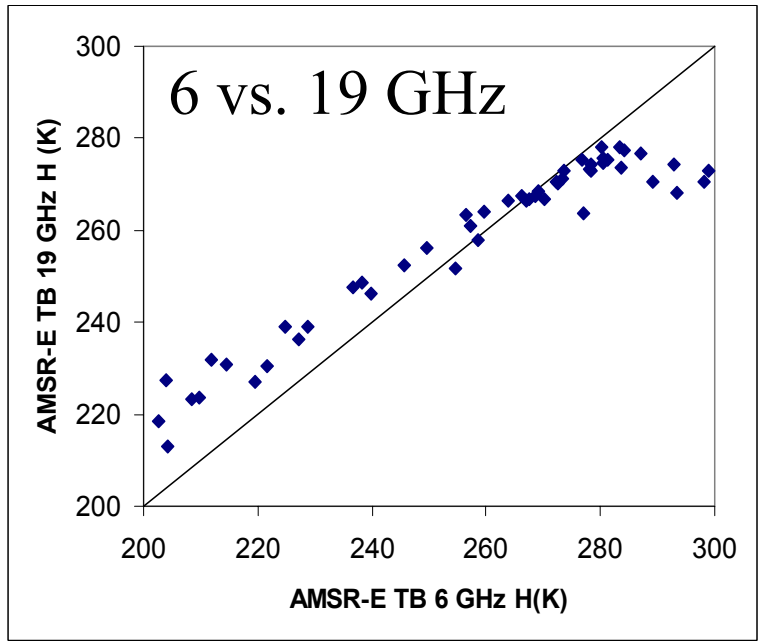
TMI and AMSR-E 10 GHz H vs. V Channel Comparisons





AMSR-E H 6 GHz vs. Channel Comparisons





TMI vs. AMSR-E (EORC) Channel Comparisons

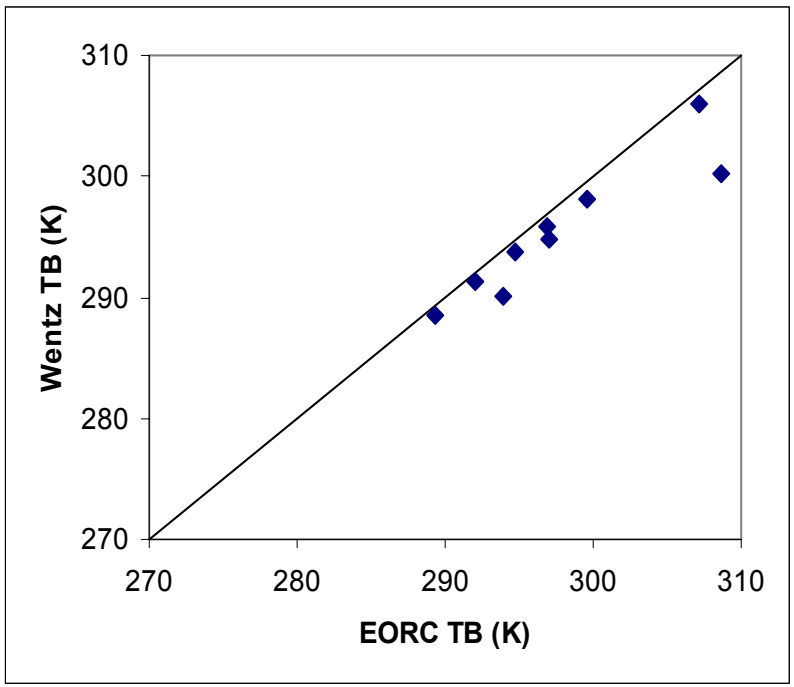
- **10, 19 and 37 GHz H channels appear to be cross-calibrated for the expected range of land surface brightness temperatures**
- **The range of TB for AMSR-E is a bit larger than that observed by TMI**
- **AMSR-E 6 GHz H is biased high, likely a result of RFI that cannot be removed**

EORC vs. Wentz Calibrations

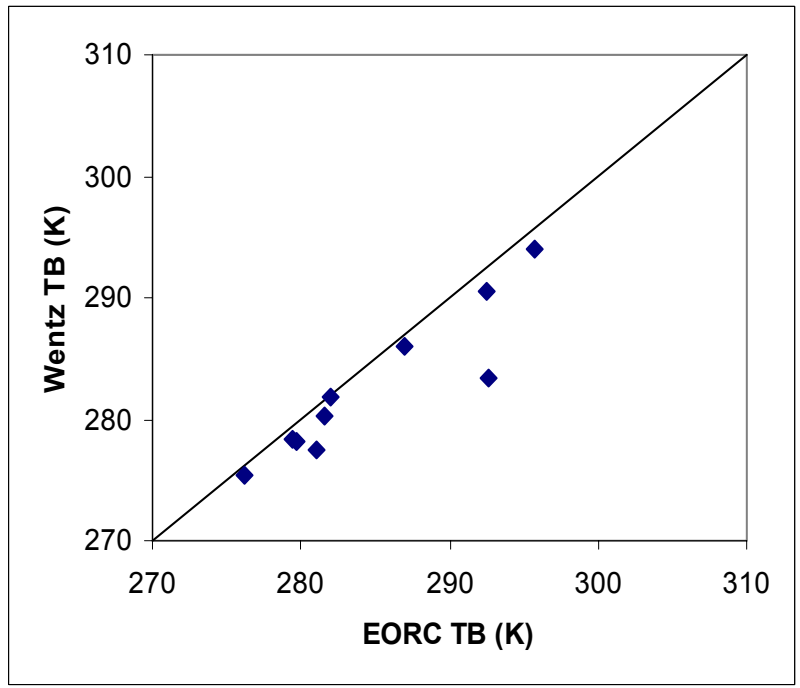
- **Several days in July 2002 over Oklahoma**
- **Footprints do not match up**
- **Averaged TB over 34.5 to 37.0 N and –97 to –99 W ~ 800 footprints**

Calibration Comparisons Oklahoma July 2002 6 GHz

V

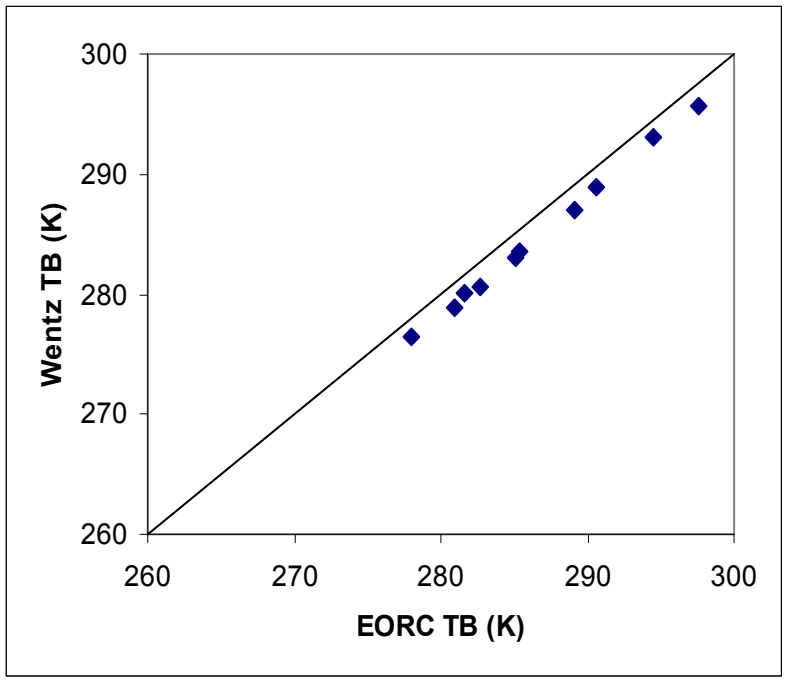


H

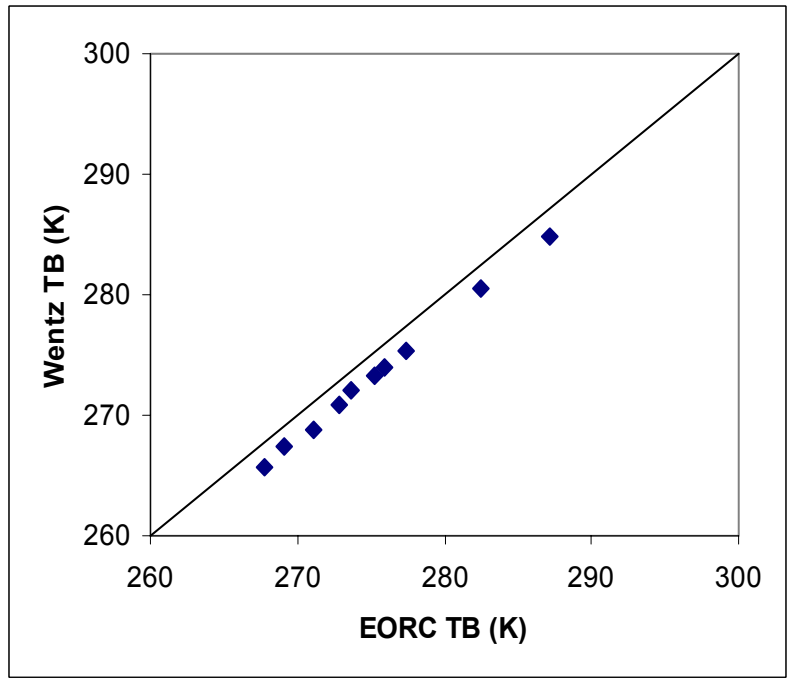


Calibration Comparisons Oklahoma July 2002 10 GHz

V

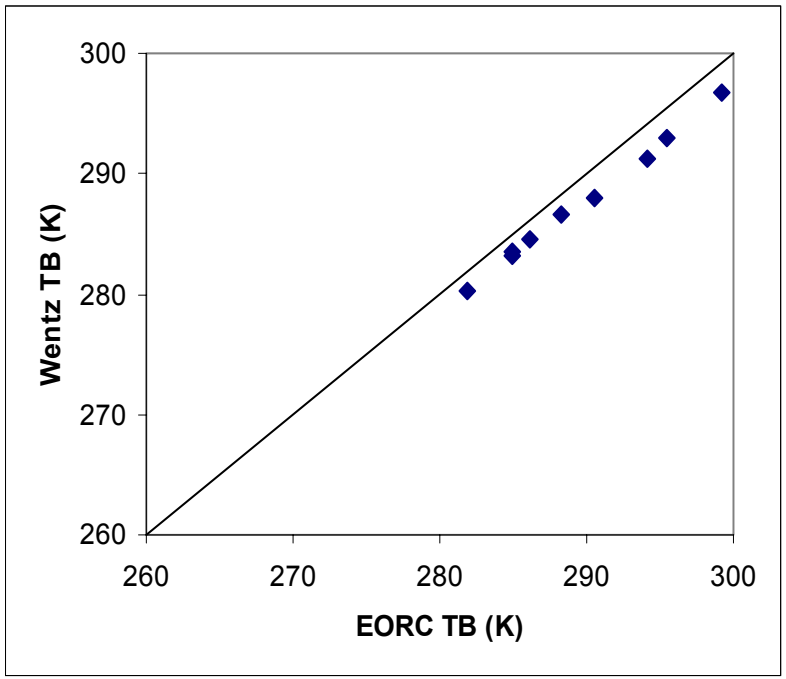


H

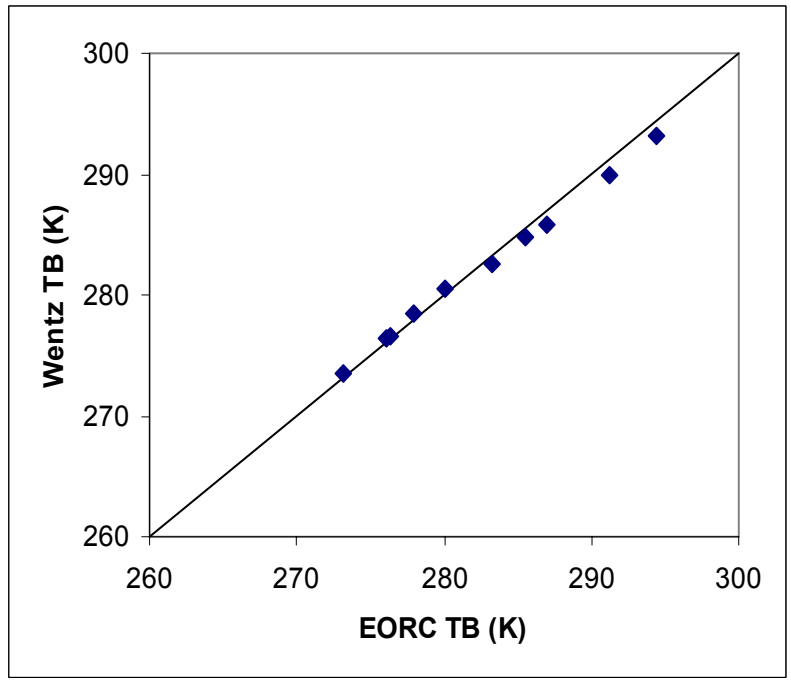


Calibration Comparisons Oklahoma July 2002 19 GHz

V

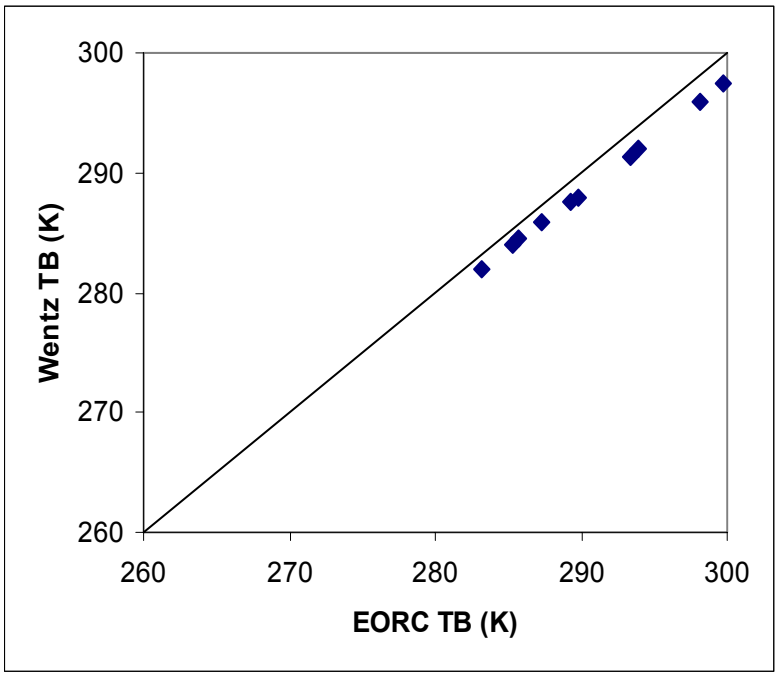


H



Calibration Comparisons Oklahoma July 2002 23 GHz

V



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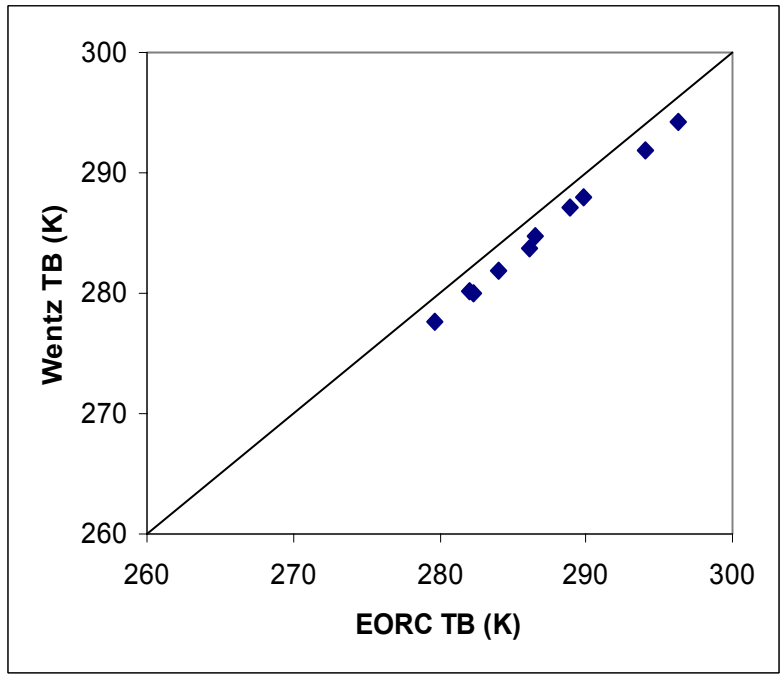
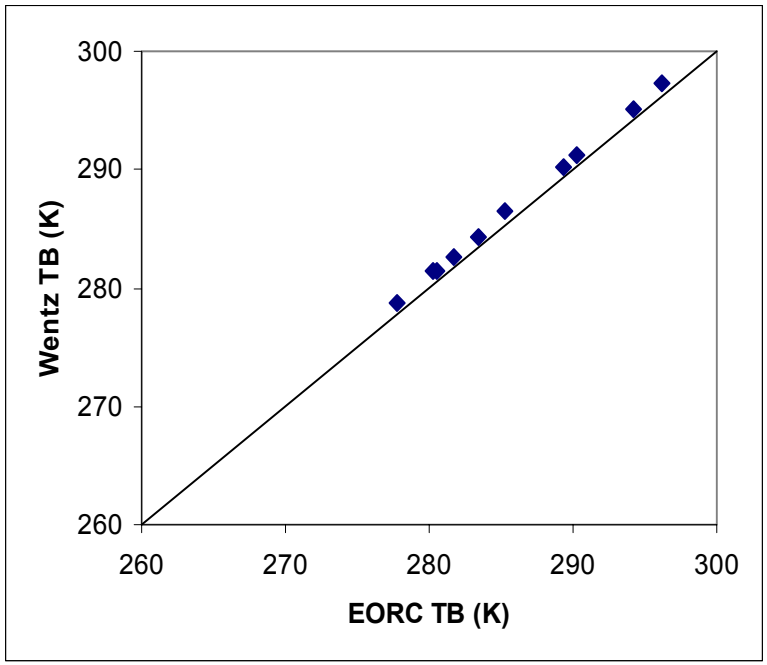
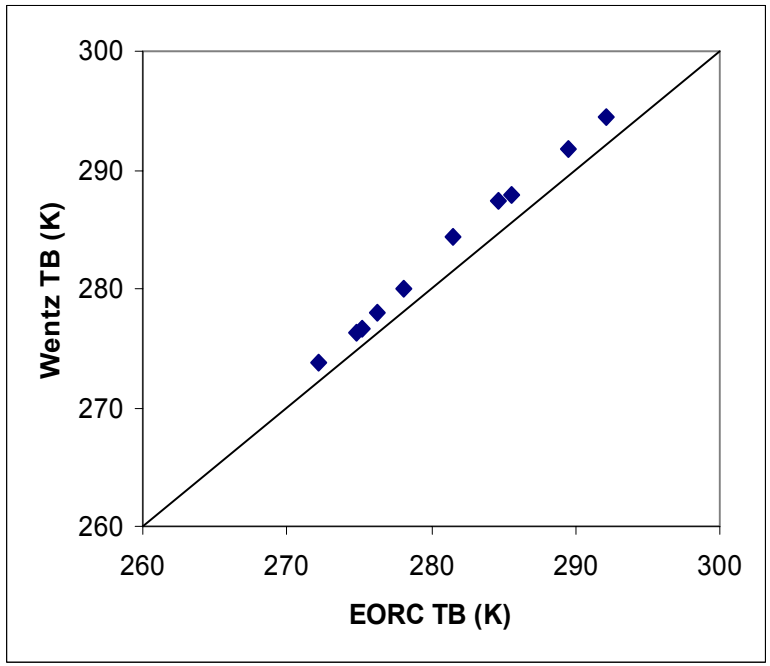


Calibration Comparisons Oklahoma July 2002 37 GHz

V



H



Calibration Comparisons Oklahoma July 2002 Wentz-EORC

Channel (GHz)	TB Difference (K)	
	V	H
6	-2.2	-2.2
10	-1.8	-2.0
19	-2.1	-0.3
23	-1.7	-2.0
37	1.0	2.1

Averaged TB over 34.5 to 37.0 N and –97 to –99 W
~ 800 footprints

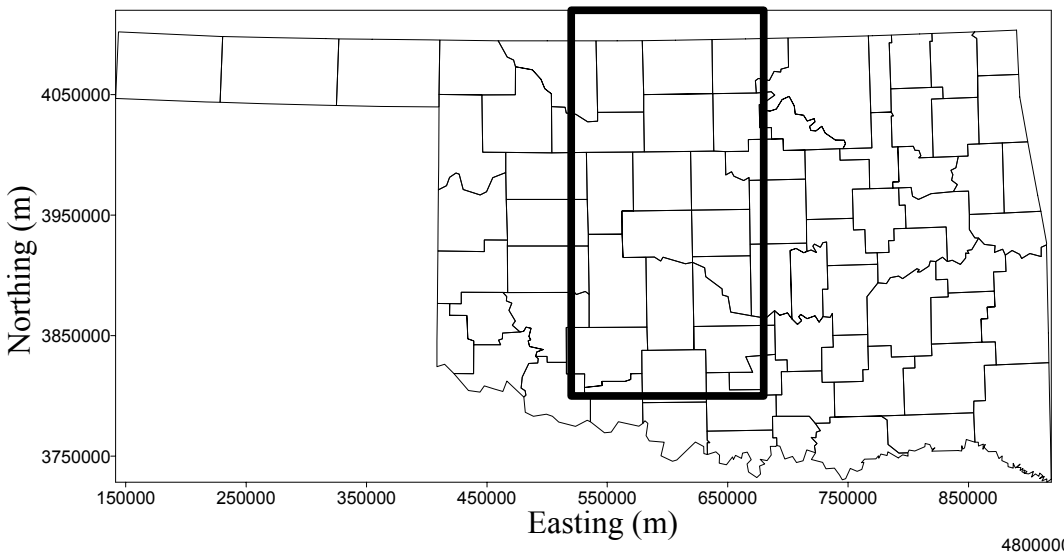
EORC vs. Wentz Calibrations

- **Most recent versions of both calibrations**
- **EROC ~ 2 K greater than Wentz except 37 GHz**
- **Uncertain about data exclusion (RFI) at 6 GHz**

RFI at 6.9 GHz

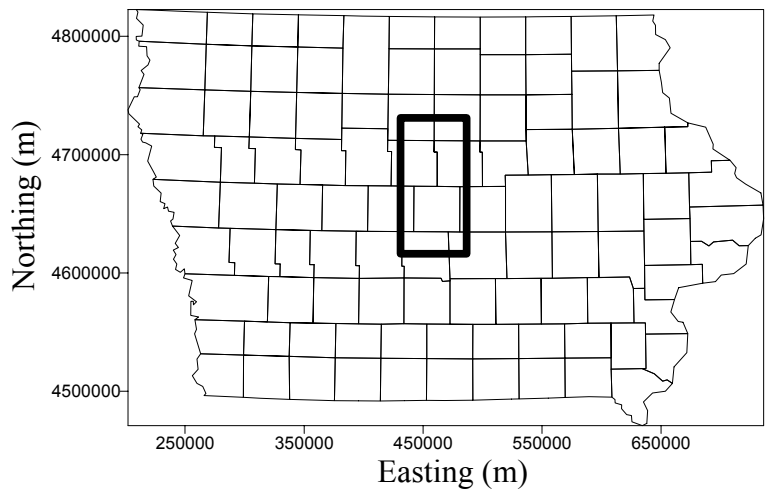
- **Two one month data sets from July 2002: Iowa and Oklahoma**
- **Ascending and descending**
- **6.9 GHz H and 10.7-6.9 GHz H RFI Index**
- **RFI exists….true spatial extent?**
- **Impact on soil moisture algorithms over U.S.**

RFI at 6.9 GHz:Two one month data sets from July 2002



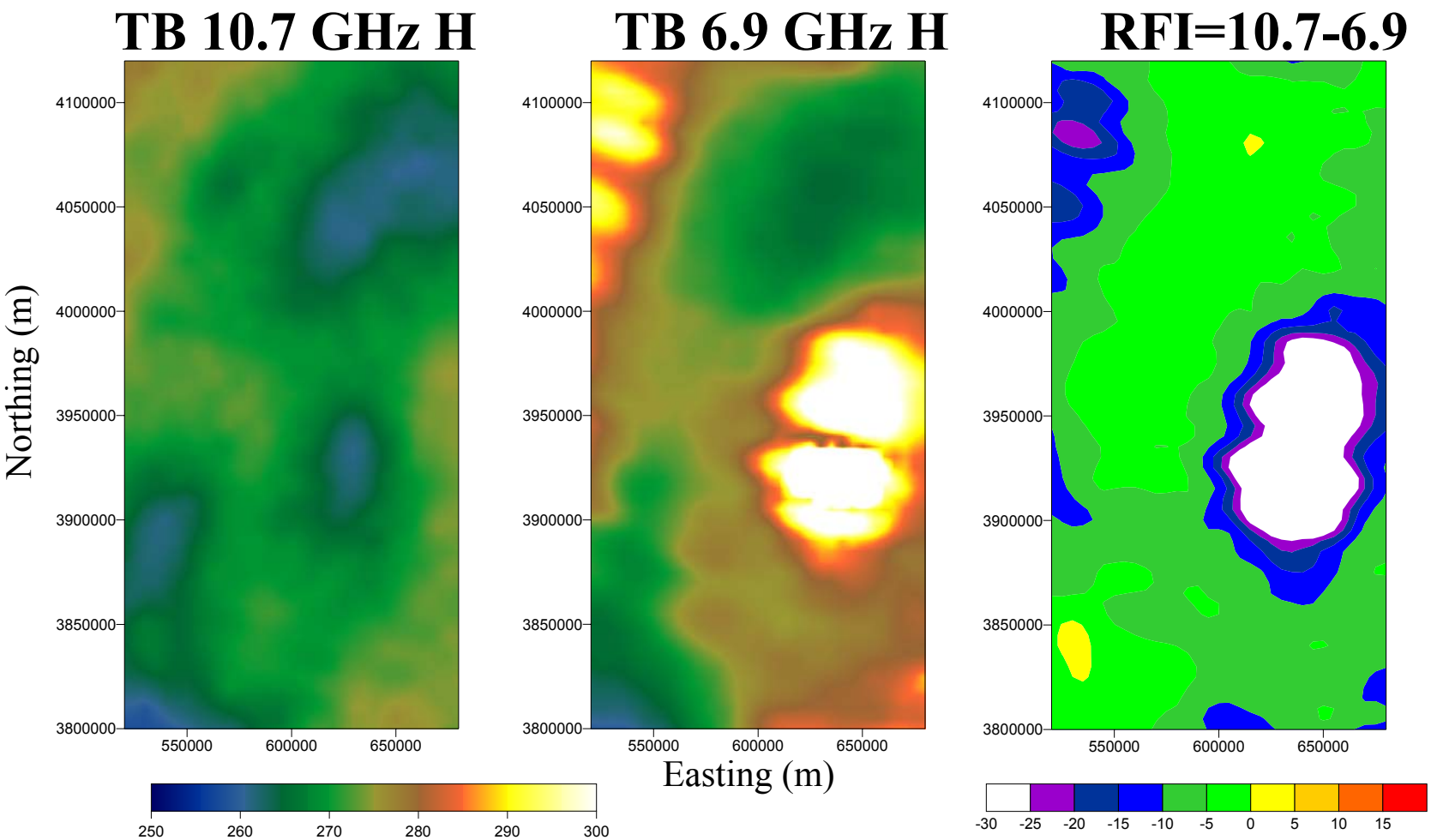
Oklahoma

Iowa



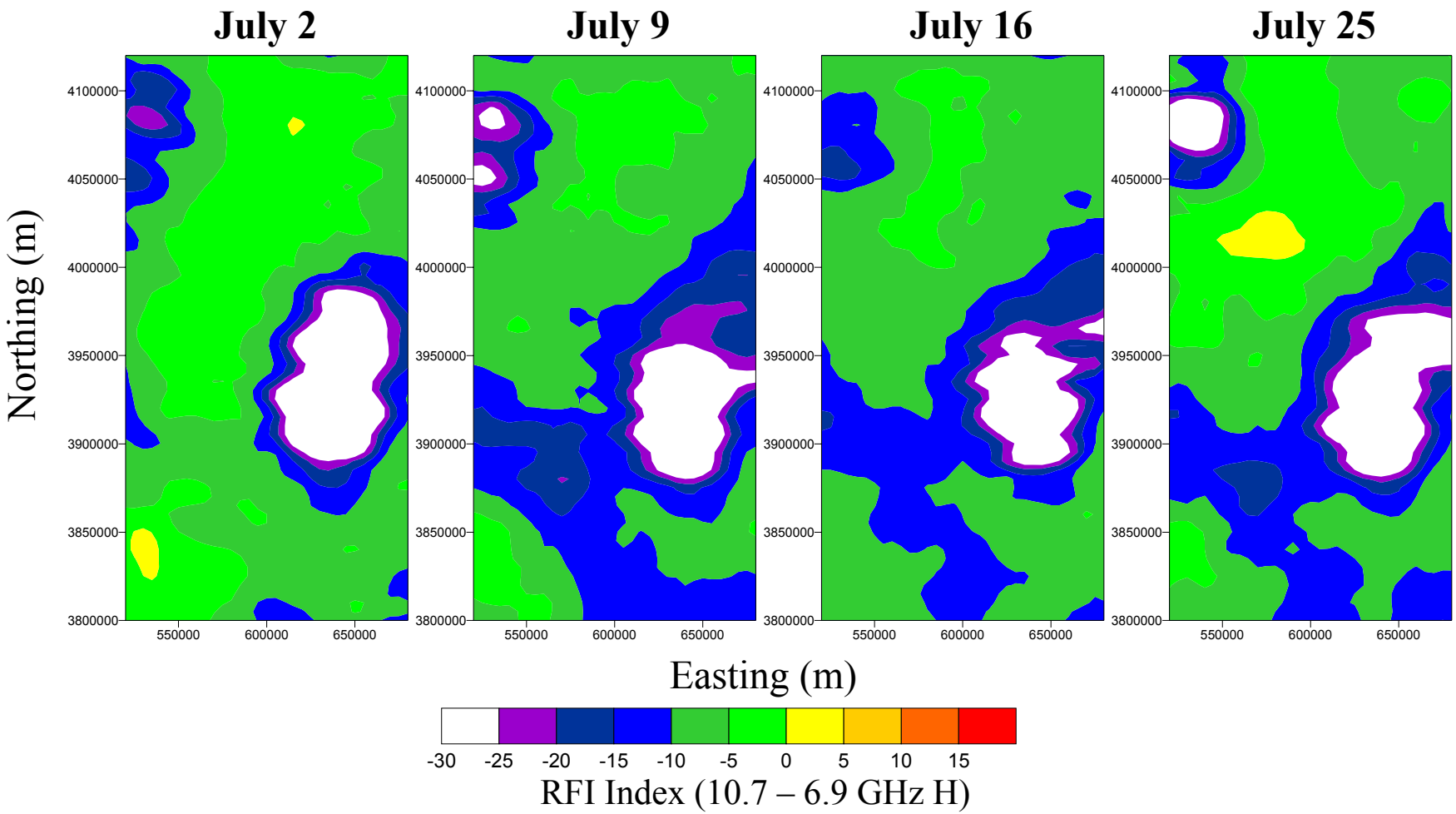
AMSR-E RFI Index OK Region

July 2, 2002 Descending



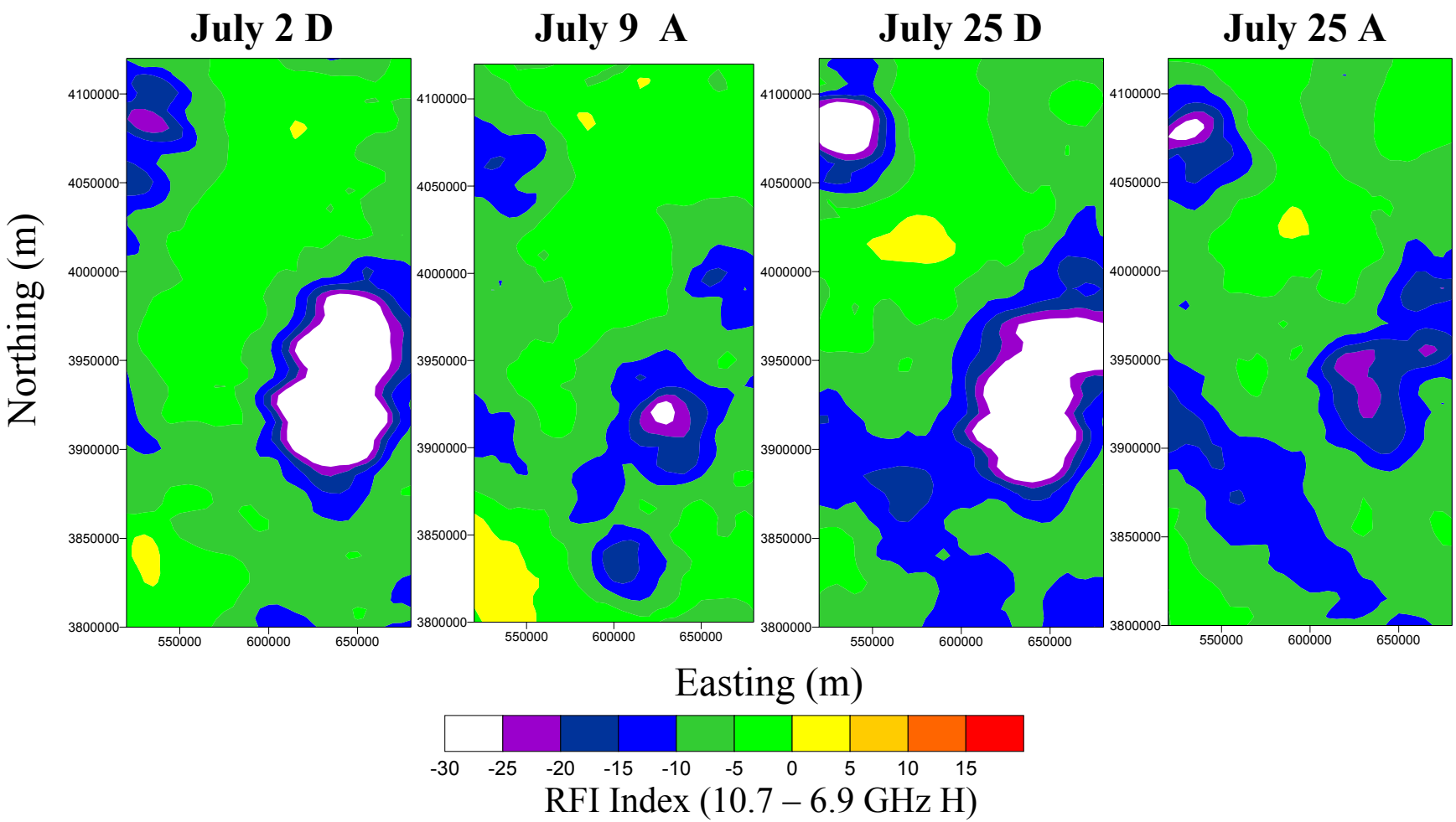
AMSR-E RFI Spatial Patterns Oklahoma July 2002

Temporal Sequence of Descending Passes



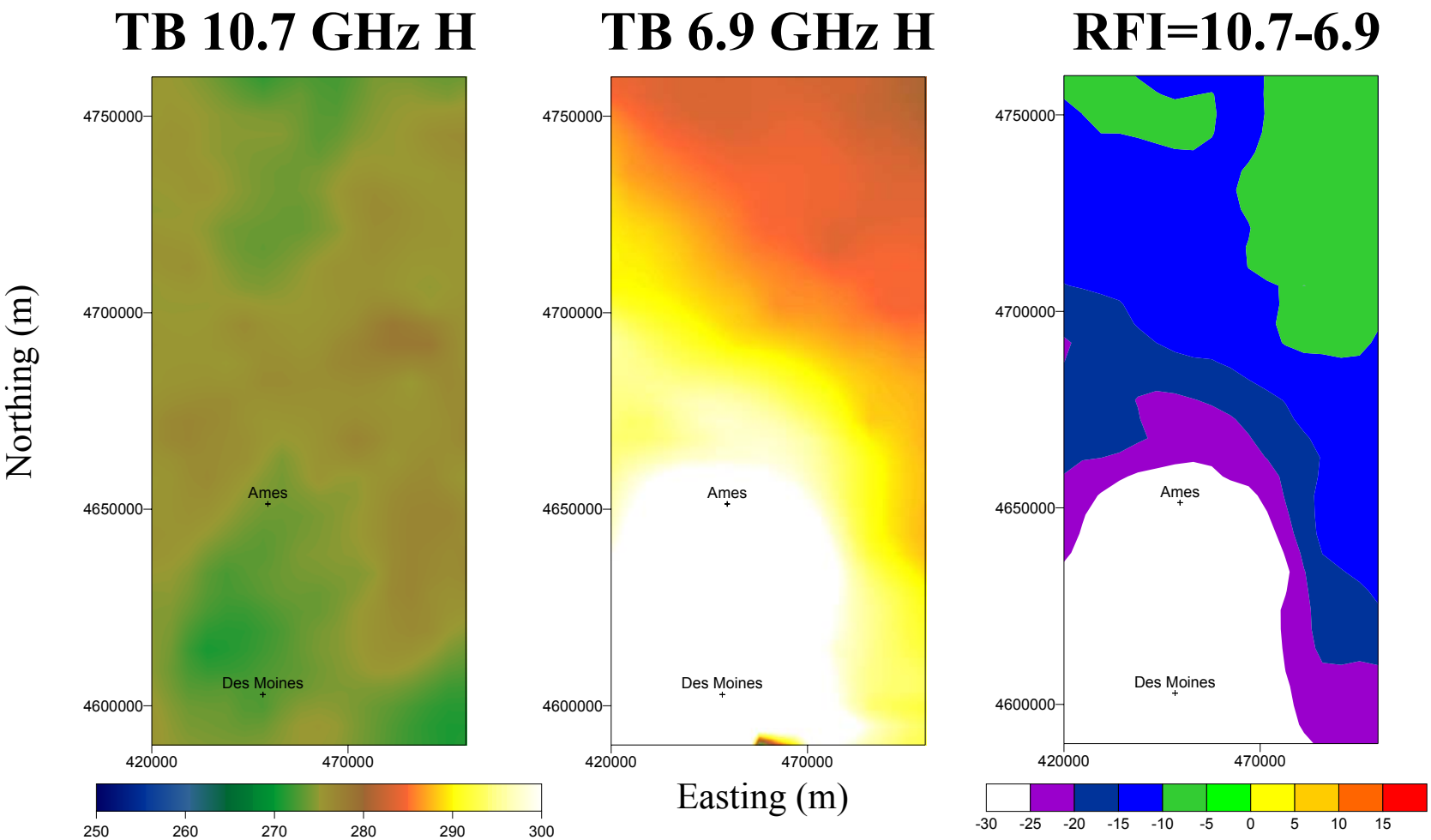
AMSR-E RFI Spatial Patterns Oklahoma July 2002

Comparison of Two Sets of Descending and Ascending Passes



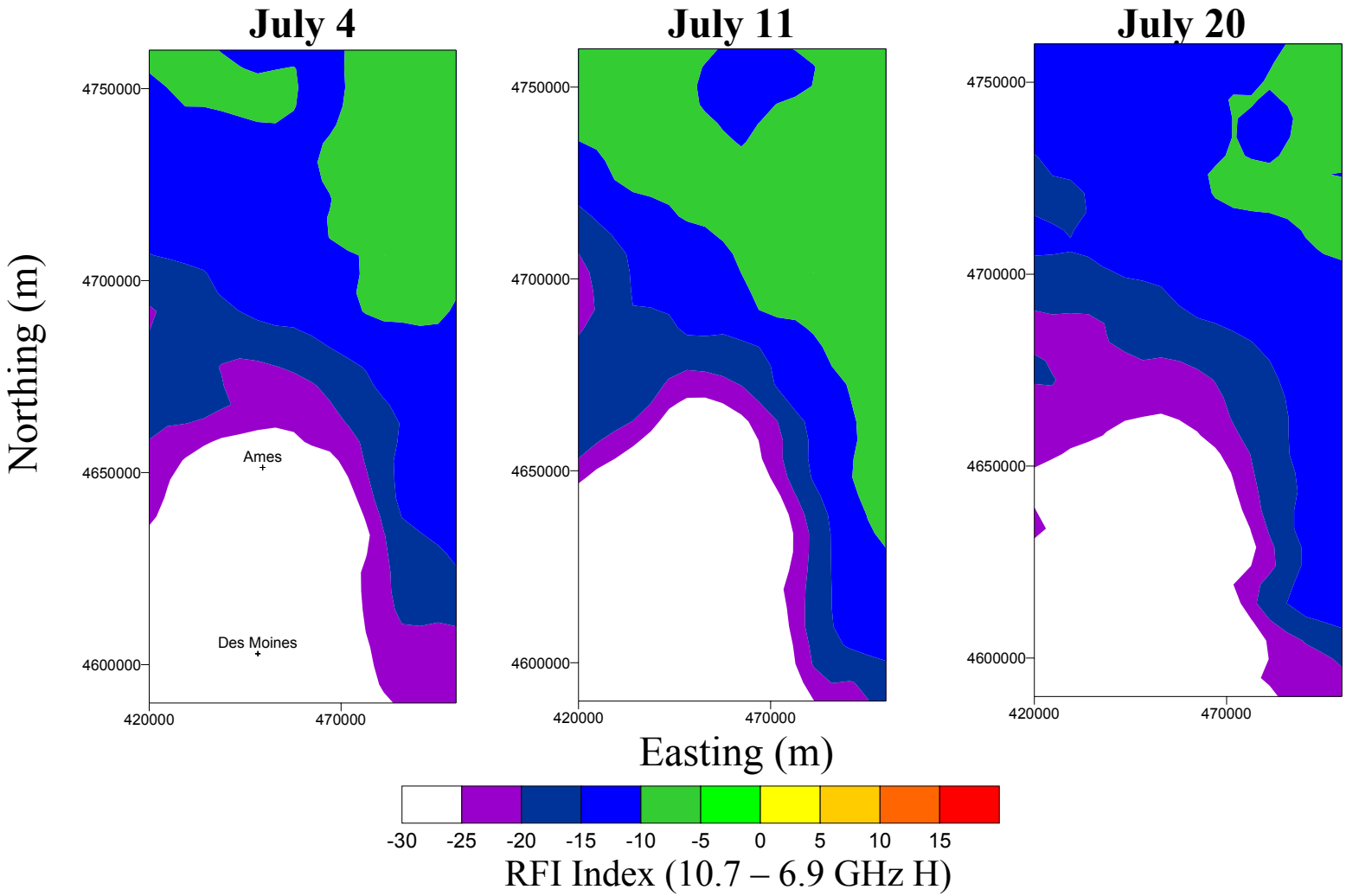
AMSR-E RFI Index Iowa Region

July 4, 2002 Descending



AMSR-E RFI Spatial Patterns Iowa July 2002

Temporal Sequence of Descending Passes



RFI at 6.9 GHz

- **RFI index: 10.7 GHz H should be > 6.9 GHz H**
- **If 6.9 and 10 GHz calibration are off this could contribute a small amount, 5 K?**
- **For Iowa, nearly the entire region has RFI > 10 K**
- **Oklahoma has some areas with RFI < 5 K**
- **Spatial patterns are temporally consistent**
- **Spatial extent and contamination is much more widespread than can be accounted for with an RFI removal algorithm**
- **Conclusion is that 6.9 GHz data is of little value for soil moisture retrieval over the U.S.**