

PRECIPITATION-RATE RETRIEVALS AT 15- AND 50-KM  
RESOLUTION USING AMSU PASSIVE MICROWAVE DATA

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Prior instantaneous precipitation-rate retrievals using neural networks operating on five limb-corrected NOAA-15 Satellite AMSU channels near 53 and 183 GHz yielded promising agreement with coincident NEXRAD 3-GHz radar observations up to 20 mm/hr (D. H. Staelin and F. W. Chen, *IEEE TGARS*, **38**, 2322-32, 2000). That earlier work, based on four early NOAA-15 summer and fall satellite orbits, has been superseded by this study of 21 orbits distributed over an entire year. In addition, the 50-km resolution data obtained near 53 GHz has been converted to equivalent 15-km data based on precipitation morphology evident near 183 GHz, permitting rain rates up to 200 mm/hr to be retrieved. Finally, all but the two upper stratospheric AMSU channels are now utilized.

One performance metric is the rms error between AMSU and NEXRAD retrievals smoothed to match AMSU beamwidths. Those 2353 precipitating pixels not used to train the 15-km neural network were partitioned into six NEXRAD rain-rate categories: 1-2, 2-4, 4-8, 8-16, 16-32, and >32 mm/hr. The rms discrepancies between these 15-km resolution AMSU and NEXRAD retrievals are 1.6, 2.0, 3.3, 7.7, 14, and 39 mm/hr for the six categories, respectively. When the 15-km retrievals are smoothed to 50-km resolution the rms discrepancies for the same six categories are 1.1, 1.7, 2.9, 6.4, 12, and 23 mm/hr, respectively, for 1494 precipitating 50-km pixels. For light rain (0.5-1 mm/hr) the 50-km rms discrepancy is 0.84 mm/hr. It is not clear how much improvement can be obtained in this metric, for these discrepancies are also arguably approaching the intrinsic accuracy of NEXRAD itself.

Another metric tests whether either sensor sees heavy rain when the other does not. For this same set of 2353 precipitating 15-km pixels, none of the 88 pixels for which AMSU retrieved over 31 mm/hr were observed by NEXRAD to be raining below 10 mm/hr. Similarly, none of the 114 pixels for which NEXRAD observed over 35 mm/hr were seen by AMSU to be raining below 3 mm/hr.

A final metric involves sensitivity to snowfall. At 2305 UTC on March 5, 2001 a major storm that left two feet of snow in parts of New England was imaged by ASMU; the same retrieval algorithm yielded up to 11.5 mm/hr precipitation. When AMSU passed over New England 4.5 hours earlier and 8 hours later it saw almost no precipitation, which was also consistent with ground observations

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