COMPARISON OF TEMPERATURE MEASUREMENTS IN THE MIDDLE ATMOSPHERE BY SATELLITE WITH PROFILES OBTAINED BY METEOROLOGICAL ROCKETS

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Measurements using the inflatable falling sphere technique have occasionally been used to obtain temperature results from density data and thereby provide comparison with temperature profiles obtained by satellite sounders in the mesosphere and stratosphere. To insure density measurements within narrow time frames and close in space, the inflatable falling sphere is launched within seconds of the nearly overhead satellite pass. Sphere measurements can be used to validate remotely measured temperatures but also have the advantage of measuring small-scale atmospheric features. Even so, with the dearth of remaining falling spheres available (the manufacture of these systems has been discontinued), it may be time to consider whether the remote measurements are mature enough to stand alone. Three field studies are considered, one in 2003 from Northern Sweden, and two in 2010 from the vicinity of Kwajalein Atoll in the South Pacific and from Barking Sands, Hawaii. All three sites are used to compare temperature retrievals between satellite and in situ falling spheres. The major satellite instruments employed are SABER, MLS, and AIRS. The comparisons indicate that remotely measured temperatures mimic the sphere temperature measurements quite well. The data also confirm that satellite retrievals, while not always at the exact location required for detailed studies in space and time, compare sufficiently well to be highly useful. Although the falling sphere will provide a measurement at a specific location and time, satellites only pass a given location daily or less frequently. This report reveals that averaged satellite measurements can provide temperatures and densities comparable to those obtained from the falling sphere, thereby providing a reliable measure of global temperature.