The meeting, kindly hosted by Fuzhong Weng, commenced at 9:30 AM. Tom Wilheit spent a few minutes reminiscing about the contributions of Joanne Simpson to Precipitation Measurements Missions and then discussed the aims for the meeting.

Tim Hewison of EUMETSAT discussed the work of the Global Space-Based Inter-Calibration System (GSICS). They have a substantial history of work with infrared sensors and are beginning to work on microwave radiometers as well. Since their work and that of X-CAL are similar, it makes sense to keep each other apprised of progress. The consensus was that each group should work independently for now in order that each can understand more clearly exactly what products they need, but we should look forward to some future division of labor based on the strengths of each team.

Yong-Hoon Kim of the Gwangju Institute of Science and Technology (Korea) discussed the status of the DREAM radiometer. Their first copy was lost in a launch failure last August. Dr. Kim showed a video of the launch and explained the nature of the failure. Fortunately, they had a spare flight instrument and are preparing for a July 2010 launch.

Jim Wang of SSAI discussed comparisons of TBs computed from the radiosondes at the DOE/ARM/SGP site with AMSU observations. He found differences of as much as 5K (observations lower than computations) but that the difference was roughly halved when the proper bandwidths were included in the computation.

Sayak Biswas of the University of Central Florida presented an update on the implementation of the TMI correction in processing Version 7. Many changes had been recommended at the Salt Lake City meeting (October 2009) and they have been incorporated. The key changes were splitting the table into two for the two yaw configurations of the space craft and making the correction zero-mean so that we are not recalibrating to a model. An earlier scaling error in translating the corrections from the 10V channel to the remaining channels was also corrected.

Steve Bilanow of Wyle (PPS) reported on thermal modelling of the TMI reflector done at GSFC. The size of the thermal cycle from the model was very close to the thermal cycle inferred from the correction discussed above, well within the error bars of thermal models. This corroborates our interpretation of the orbital cycle seen in the TMI error as being due to the antenna emissivity.

Fuzhong Weng of NOAA discussed the calibration of operational microwave sensors including the tests for cross track bias, sun/moon in the cold calibration and extensive performance monitoring. He briefly discussed the use of numerical weather prediction models as transfer standards using the double difference technique. (More on this from Rafik Hanna later)
Shannon Brown of JPL has been working the problem of maintaining a consistent calibration for the radiometers on various altimetric spacecraft, a problem quite similar to X-CAL. He gave a presentation on his work. Because he makes comparisons with many of the same instruments, some of his results are directly comparable with X-CAL’s. His calculations of the warm end TMI calibration error relative to Windsat agreed extremely well with others presented at the meeting for the 19 and 21 GHz channels of TMI (Those were the ones he computed.) His automated recalibration system will be instructive to X-CAL as we become more operational.

Matt Sapiano of Colorado State University discussed comparisons of SSM/I and TMI brightness temperatures. They find a disturbing trend: each of the SSM/I's shows a drift of the order 0.5K/decade relative to TMI. Since it is unlikely that all the SSM/I's are drifting, one would conclude that the TMI is drifting. If this proves to be true, the consensus calibration we generate here will only be relevant to the July 2005 to June 2006 epoch. Linwood Jones stated that in the UCF work they do not see any TMI drift and that their sensitivity level would be about 0.2K/decade.

Because of the concern over this drift, the University of Michigan group applied their vicarious method to look for a TMI drift. Darren McKague presented their results. The 10V channel results had very little noise and had a drift of much less than 0.1K/decade if any. Other channels suggested drifts of the same order as the CSU results but were too noisy to draw firm conclusions. The jury is still out on TMI drifts.

One of the main objectives of this meeting was to determine the error in TMI assuming Windsat as a baseline. Sayak Biswas presented the University of Central Florida results. For the cold end they used radiative transfer calculations over the oceans based on NCEP profiles. They found extensive RFI that had to be filtered from the results. Much of the RFI could be attributed to geosynchronous TV satellites. For the warm end they used the Amazon model of Brown and Ruf to compute TBs for high emissivity (and low polarization) regions in the Amazon basin. By using a double difference technique, they were able to minimize the impact of the specific model assumptions. Their numbers were generally consistent with those Tom Wilheit had provided the week before the meeting.

Darren McKague of the University of Michigan returned to the limelight to discuss the University of Michigan results on TMI errors based on Windsat. He presented a detailed examination of the impact of incidence angle variability. His cold calibration numbers were generally consistent with the Wilheit and UCF results but the warm end results were not yet ready. They have been recently provided and are still generally consistent.

Tom Wilheit of Texas A&M University presented his analysis of the TMI calibration error based on Windsat. His numbers had been circulated earlier. He also presented an argument for a consensus calibration that would weight Windsat half again as much as TMI (i.e. 60% Windsat - 40% TMI) and challenged the others to generate their own opinions in the matter.

Keiji Imaoka of the Japan Aerospace Exploration Agency (JAXA) discussed a number of activities related to X-CAL. They have been retrieving parameters from AMSR-E and TMI and
monitoring their performance. They have also been examining the data from both for RFI and other spurious signals.

Bill Blackwell of Lincoln Laboratories has agreed to join the X-CAL working group and serve as liaison for the ATMS radiometer a 22 channel cross track scanner ranging from 23 to 183 GHz. He gave the group an introduction to ATMS and its calibration plan.

Tom Wilheit and Fuzhong Weng have received a dataset from Peter Bauer of ECMWF giving the fitting residuals of the MSU and AMSU-B radiances using the ECMWF forecast model. As a bonus presentation, Rafik Hanna of the University of Maryland, who is working with Fuzhong Weng in analyzing this dataset, discussed his first impressions of the data. It is too early for any firm conclusions as the dataset is very large and rich. When analyzed in a manner similar to Weng’s double difference (O-A) or (O-B) analyses of the NCEP data it should give us much more confidence in using forecast models as transfer standards among microwave sounder calibrations.

In discussion it was clear that in many cases the various groups comparing Windsat and TMI arrived at very similar values by very different means. However there were some cases of discrepancies of the order of 1K that need to be resolved. “Versionitis” appears to be one source of scatter as the various groups were using an assortment of TMI products. I was agreed that when we get the official TMI Version 7 we would rerun the analyses to make sure we were all on the same page. When we have an agreed upon consensus calibration, we will apply it to the TMI and test it on some geophysical algorithms to make sure we haven’t made anything worse.

While the dust is settling on the TMI-Windsat analysis, we will attack another sensor to add to the mix. Originally we thought the SSM/I was would be logical. However, Wes Berg pointed out that the CSU/NOAA team would have a cleaner version of SSM/I available in the fall and it would make sense to delay that sensor until the new data set is in place. We decided that most of us would start looking at AMSR-E and some would look at cross track scanners. Eventually we will need this sort of parallelism to keep up with a continually changing mix of sensors in the constellation.

We decided that our next meeting would be at University of Central Florida during the last few days of June 2010. June 29 and 30 (Tuesday and Wednesday) have been suggested.