Multiple Wavelength and Refraction Session Summary

Chair: Erricos Pavlis

Gurtner presented recent changes at Zimmerwald. The system used internal, near-realtime calibration until June 2006. The change was necessitated after routine operations with a second wavelength (infrared) revealed differences between the calibrated ranges of the two colors that could not be explained as errors in the applied refraction models. It turned out that the internal calibration values of the infrared chain showed variations that had not much to do with system calibration. The source of these variations could not be identified. In June 2006 the station switched to external calibration and the differential biases were by and large eliminated. One of the concluding remarks was the need of a 100-fold improvement in the dual wavelength data if they are to be used for refraction modeling.

Müller reported that Lageos-1/2 multi-wavelength normal point data from Zimmerwald and Concepcion were reduced with DGFI's s/w, to estimate station coordinates and color dependent biases. The statistics and the history of bias differences for the Marini-Muurray and Mendes-Pavlis refraction models were shown. Full-rate tracking data were also analysed to determine if they lead to results different from the use of onsite normal points. The switch from internal to external calibration at Zimmerwald resulted in a significant improvement of the relative biases, mainly for the infrared side. The tests indicated the superior performance of the new refraction model of Mendes-Pavlis.

Pavlis (for Hulley) presented the validation of the new, sub-millimeter accuracy, zenith delay model of Mendes and Pavlis, [2004] and the sub-centimeter accuracy mapping function of Mendes et al., [2002], using global data from the Atmospheric Infrared Sounder (AIRS), the European Center for Medium Weather Forecasting (ECMWF) and the National Center for Environmental Prediction (NCEP). The models however are still far from the required sub-millimeter accuracy goal for future SLR analysis standards and the requirements place on SLR by the Global Geodetic Surveying System (GGOS) [Pearlman et al., 2005]. They thus developed a new technique, using 3D ray tracing that includes the effects of horizontal refractivity gradients. Global statistics for two years indicated delays can reach even 5 cm at an elevation angle of 10° at certain times of the year and at some locations. Application of the method to a two-year set of global SLR data resulted in variance reduction of the residuals by up to 45%, and 3 mm in RMS.

Hamal reported on a joint activity with Chinese groups using multiple wavelength SLR. He described a novel use of a Single Photon Avalanche Detector (SPAD) for sub-centimeter ranging precision in infrared and sub-millimeter precision ranging in the visible region. This optimum configuration was implemented at the Shanghai station. Ranging was done successfully to satellites distances of 30000 km with one-centimeter precision. The results of direct measurements of atmosphere dispersion were compared to existing refraction models.

Sierk gave a lengthy, entertaining and very animated report of the upgrading activities at Wettzell and Conception in an impromptu, unscheduled entry in the session. The brief, 2-

slide presentation turned out to be a several dozens of slides rolling recollection of every gory detail, of the elaborate steps in upgrading the two systems. At the behest of the anxiously awaiting next presenter, the late Karel Hamal, the chairman had to almost resort to force to put an end to the captivating performance.