1035-86-431 **Samuel S Shen*** (shen@math.sdsu.edu), Department of Mathematics and Statistics, San Diego State University, San Diego, CA 92182. *A Theory for Estimating Uncertainties in the Assessment of Global, Hemispherical and Regional Surface Air Temperature Changes Since 1861.*

After the data homogenization process, the uncertainties of the global and hemispheric average annual mean surface air temperature anomalies in the last one and half centuries are mainly due to the sampling errors of incomplete coverage of the observations over both land and ocean. This talk will describe a spectral theory of using empirical orthogonal functions (EOF) to estimate and to minimize the mean square error of sampling of surface air temperature anomalies since 1861. The errors of climate data and spatial inhomogeneity of climate field are taken into account. The minimization of the error between the true and estimated averages leads to the optimal averages at various spatial scales ranging from global to regional. The climate warming trend and its uncertainties at the global, hemispheric, and regional scales are analyzed. The error theory implies that the uncertainties of climate change assessment are in the first order dependence to the temporal variances of climate modes represented by EOFs but are insensitive to the exact spatial shapes of the modes. References: (1) Shen et al. (2007): J. Climate 20, 2321-2331; (2) Folland et al. (2001): Geophys. Res. Lett. 28, 2621-2624; (3) Shen et al. (1998): J. Climate 11, 2340-2350. (Received September 06, 2007)