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Quality of atmospheric fields for geodetic studies

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The atmosphere has been seen to be an important element in interpreting geodetic variations and in determining geodetic measurements. The atmosphere exchanges angular momentum, mass, and energy with its surroundings, and these properties impact many of Earth's global and regional properties, including its position and motions. Thus, for example the varying angular momentum of the atmosphere, which is dependent on the motion of the winds and the mass distribution, often measured by its surface pressure, is related to the angular momentum of the solid Earth, and hence its rotation in three dimensions. Also, the mass distribution of the atmosphere, which is variable in time and space, is related to the overall planetary gravity field. Both the dry and moist components of the air mass distribution represent different aspects of the atmospheric properties. Lastly, the atmosphere's energy distribution and its radiational properties play roles in its connection to the overall geodetic series quantities.

Based on the analysis-forecast systems resident at the major operational and research weather centers, fields of meteorological parameters are available to calculate the needed geodetic quantities. The atmospheric analysis-forecast systems in use accept a variety of data from land-based, space-based and in situ atmospheric observations, and after assimilation is performed, consistent with the dynamics of the model, the systems produce series of 3-dimensional meteorological fields. The Special Bureau for the Atmosphere of the International Earth Rotation and Reference Frames Service (IERS) and its collaborators have been calculating, collecting, interpreting, and distributing atmospheric data based on fields from several of the world's weather cen-

ters: the U.S. National Centers for Environmental Prediction, the European Centre for Medium-Range Weather Forecasts, the Japan Meteorological Agency, and the United Kingdom Meteorological Office, which have been primary participants. Other national agencies have produced other such analyses and forecasts. The fields necessary for angular momentum analyses and forecasts have been available at different latencies and for forecasts, different lead times. Fields used for other geodetic projects, like the gravity measuring missions, which are defined over longer than daily time scales, need sequences of atmospheric data for dealiasing signals. For very high temporal resolution studies, the forecasts within such systems, when they can be determined on very rapid time scales, such as hourly, can be considered; fields from NASA's Global Modeling and Assimilation Office models are noted here. While generally based on similar models and observations, differences among the various analysis-forecast systems can be significant. Such differences including forecast model resolution, gridding schemes or spectral approaches, data assimilation system details, and the need for initialization procedures, will be reviewed, and available meteorological observations will be considered. Especially highlighted will be those aspects that relate to the various geodetic parameters.