1.4.1 Regional Analysis and Re-analyses of Different Variables for Specific Purposes

Global re-analysis data sets like ERA-40 (the 40 years re-analysis of the European Centre for Medium-Range Weather Forecasts, ECMWF, see www.ecmwf.int/research/era/) and the NCEP (National Centre for Environmental Prediction, USA) products (www.cdc.noaa.gov/cdc/reanalysis/) have a number of shortcomings, which need to be improved or extended for BALTEX Phase II. Observations of clouds and precipitation need to be included in a regional re-analysis which should be performed on finer spatial scales. Especially precipitation fields should be made available over land areas with resolutions down to a few kilometres on at least a daily base for use *e.g.* in hydrological studies and analysis of extreme events. This requires the merging of Radar data with surface observations and possibly with satellite data. Also wind fields over the Baltic Sea are required in higher resolution in order to remove the influence of land effects. New radiation parameterisation schemes should be implemented to better estimate the components of the surface radiation budget *e.g.* from satellite observations. Error estimates should be an integral part of the derived fields. Addressing the last 40 years is also very relevant for the analysis of climate variability and change (Chapter 2), see section 2.4.1 in particular.

Generally, there is not one regional analysis data set available serving all purposes in BALTEX Phase II. In this broad view, at least five types are envisioned and should be established:

1. Re-analysis data sets for a better understanding of the current climate: This re-analysis will include all available measurements of the past 10 to 20 years assimilated in a regional dynamic model system.
2. A full re-analysis, which exploits all local data, is sensitive to changes in the observational coverage. A less sensitive approach is to assimilate large-scale features instead, provided by a global re-analysis. Obviously, such an approach returns less skilful reconstructions but, with its likely lower sensitivity to data inhomogeneity, it thus allows a better estimation of long-term trends and low-frequency variability. Such efforts have already been implemented, and the results are used for assessing changing climate conditions; however, further improvements, in particular with better spatial resolution, shall be pursued, in particular for the Baltic Sea basin.
3. Re-analysis data sets in climate change and variability studies: The spatial and temporal homogeneity of measurements is of highest importance in order to suppress spurious trends and variability caused by temporal changes of data availability (see also Chapter 2.4.1).
4. Re-analysis data sets with reduced model influence. These data sets should be based on as few model assumptions as possible (intelligent interpolation) in order to be used as independent data sources for regional climate model evaluation.
5. Re-analysis data sets using models run in climate mode, without data assimilation. This serves the purpose of the development and evaluation of models applied for future projections (see Chapter 2.4.1).