7.14 Meteorological geographical features

Definition:

(INSPIRE, 2007) Weather conditions and their measurements; precipitation, temperature, evapotranspiration, wind speed and direction.

Description:

Historical versions of the theme definition are found in the INSPIRE IMS and Scoping papers:

- Weather conditions and their measurements; precipitation, temperature, evapotranspiration, wind. (INSPIRE IMS, 2003)
- Weather conditions and their measurements; precipitation, temperature, evapotranspiration, wind speed and direction (INSPIRE Scoping, 2004)

In order to place into context the range of spatial data types relevant to this theme, we consider the typical 'forecast cycle' of a national meteorological service (NMS). This will: (a) collect meteorological observations over (say) a six-hour interval, (b) 'assimilate' these into a numerical model to produce an estimate of the current atmospheric state, (c) use this analysis as the initial condition for a model forecast run forward in time (typically out to several days). Four broad types of data are involved at different phases of the cycle:

1. **Observations**: around 11000 surface stations globally make up the Global Observing System, reporting such atmospheric parameters as weather, cloud, temperature, humidity, wind, visibility, pressure. A subset of these stations make '*climate observations*' which include daily temperature minimum and maximum, sunshine hours, rainfall amount etc. In addition, around 1000 '*upper-air*' stations make radiosonde (free-rising balloon) observations of pressure, wind, temperature and humidity. Voluntary observing ship and drifting buoys make *marine observations* including sea surface temperature, and wave height and period. Several hundred thousand reports per day of pressure, winds and temperature are made from *aircraft observations*.
2. **Synoptic analysis**: Gridded wind, temperature, humidity, geopotential height, precipitation, etc. Also, 'sensible weather' elements (fronts, cloud, thunderstorm activity etc) will be analysed.
3. **Forecasts**: Numerous forecast products are produced operationally. A conventional weather forecast contains similar elements to the synoptic analysis.
4. **Climatological data**: Long-term time-series' of data (either observations or analyses) may be analysed statistically to create climatologies (e.g. 20th century decadal averages, seasonal/monthly minimum or maximum, etc.).

There is considerable overlap and ambiguity between the themes 'Atmospheric conditions' and 'Meteorological geographical features' – e.g. weather conditions ('Meteorological geographical features') including precipitation, temperature, wind etc. are precisely components of the atmospheric state ('Atmospheric conditions'). Numerous suggestions have been made by stakeholders to resolve this ambiguity. They include:

- merging the themes (it is impossible to amend the Directive, but it would be sensible to consider the themes jointly during data specification development)
- distinguishing 'field-based data' (*Atmospheric conditions*) from 'point-based data' (*Meteorological geographical features*)
- distinguishing 'time-series & near-real-time data' (*Atmospheric conditions*) from 'gridded climate data' (*Meteorological geographical features*)

- distinguishing 'climate data' (*Atmospheric conditions*) from 'observations and forecasts' (*Meteorological geographical features*)

To resolve the ambiguity between themes, we consider the *multi-level approach* to data needs assessment applied in the INSPIRE 'Environmental Thematic User Needs Position Paper' (2002). Data at *local or regional level* are often needed for management and policy implementation, while lower resolution ('smaller scale') data are often required for reporting and policy development/evaluation. The latter includes *summaries and integrated data products*.

The scope of 'Meteorological geographical features' thematic data should be limited to local-level high-resolution (weather-related) data, typically observations.

- This includes synoptic observations from stations making up the WMO RA VI (European) Regional Basic Synoptic Network.

The WMO operates a dedicated network (the Global Telecommunications System) to distribute observations and data products. Data exchange is governed by WMO Resolution 40, which provides for free and unrestricted exchange of observational data 'essential' for forecast activities. 'Additional' nominated data and products may be provided with charge, while all data must be supplied free of charge (excluding costs of reproduction and delivery) for research and education. The ECOMET Catalogue (http://www.meteo.oma.be/ECOMET/Categories_of_data_and_products.htm) provides a 'one-stop shop' index of both 'essential' and chargeable data and product offerings from European NMSs. A similar catalogue is available for the European Centre for Medium-range Weather Forecasting (ECMWF) (http://www.ecmwf.int/products/catalogue/).

Scope, use examples:

Used by the environmental sector to predict natural hazards e.g. flooding, drought, forest fires. Also used by other sectors, e.g. water supply to estimate recharge, for forecasting agricultural performance, for giving meteorological forecasts to shipping etc (INSPIRE IMS, 2003).

- A range of meteorological observations is required in support of 'air and climate change' environmental policy implementation and management (ETC)
- A range of meteorological (e.g. rainfall, snow, temperature, winds) data is required for natural hazard prediction and monitoring – floods, avalanches, fires; and for the management of chemical and other hazardous events (ETC)

Important feature types and attributes:

Raw data organised by station (location, id)

Possibly high spatial resolution raw surface data, from remote sensing instrument at their best resolution

Links and overlaps with other themes:

Potential overlap with:

- Atmospheric conditions
- Oceanographic geographical features and Sea regions (especially for physical parameters associated with the boundary-layer or atmosphere/ocean interface)
- Environmental monitoring facilities (meteorological and air quality observation stations)

Reference documents:

Science Modelling Language' (CSML)", available on CIRCA (http://forum.europa.eu.int/Members/irc/jrc/imaco2000/library?l=/drafting_folders/data_specifications/reference_material/annex_iii/meteorological_geographi&vm=detailed&sb=Title)

"Marine XML", available on CIRCA (http://forum.europa.eu.int/Members/irc/jrc/imaco2000/library?l=/drafting_folders/data_specifications/reference_material/annex_iii/meteorological_geographi&vm=detailed&sb=Title)

"OGC Web Services and GML Modelling for Operational Meteorology", available on CIRCA (http://forum.europa.eu.int/Members/irc/jrc/imaco2000/library?l=/drafting_folders/data_specifications/reference_material/annex_iii/meteorological_geographi&vm=detailed&sb=Title)

"WMO Reference Information", available on CIRCA (http://forum.europa.eu.int/Members/irc/jrc/imaco2000/library?l=/drafting_folders/data_specifications/reference_material/annex_iii/meteorological_geographi&vm=detailed&sb=Title)

HALO public documents: http://www.ecmwf.int/research/EU_projects/HALO/docs_public.html

From the other reference material submitted by SDICs and LMOs, the following may be relevant to this theme:

Link list to documents relating to: Framework for the WMO Information System (submitted by GRDC)

Ross, Gil: Introduction to WMO for INSPIRE