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A High-Resolution 3D Weather Radar, MSG, and Lightning Sensor Observation Composite

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Within the research group 'Object-based Analysis and SEamless prediction' (OASE) of the Hans Ertel Centre for Weather Research programme (HerZ), a data composite containing weather radar, lightning sensor, and Meteosat Second Generation observations is being developed for the use in object-based weather analysis and nowcasting.
At present, a 3D merging scheme combines measurements of the Bonn and Jülich dual polarimetric weather radar systems (data provided by the TR32 and TERENO projects) into a 3-dimensional polar-stereographic volume grid, with 500 meters horizontal, and 250 meters vertical resolution. The merging takes into account and compensates for various observational error sources, such as attenuation through hydrometeors, beam blockage through topography and buildings, minimum detectable signal as a function of noise threshold, non-hydrometeor echos like insects, and interference from other radar systems. In addition to this, the effect of convection during the radar 5-minute volume scan pattern is mitigated through calculation of advection vectors from subsequent scans and their use for advection correction when projecting the measurements into space for any desired timestamp.
The Meteosat Second Generation rapid scan service provides a scan in 12 spectral visual and infrared wavelengths every 5 minutes over Germany and Europe. These scans, together with the derived microphysical cloud parameters, are projected into the same polar stereographic grid used for the radar data. Lightning counts from the LINET lightning sensor network are also provided for every 2D grid pixel. The combined 3D radar and 2D MSG/LINET data is stored in a fully documented netCDF file for every 5 minute interval, and is made ready for tracking and object based weather analysis. At the moment, the 3D data only covers the Bonn and Jülich area, but the algorithms are planed to be adapted to the newly conceived DWD polarimetric C-Band 5 minute interval volume scan strategy. An extension of the 3D composite to all of Germany is therefore possible and set as a goal.