1 Polar data

Polar data, in and of itself, is a problem in radar meteorology in that the measurement geometry, and therefore the spatial resolution of the pulse volume, is tremendously variable throughout the radar coverage area. There is, however, nothing to be done about this problem as long as the radar antenna revolves around one point in space.

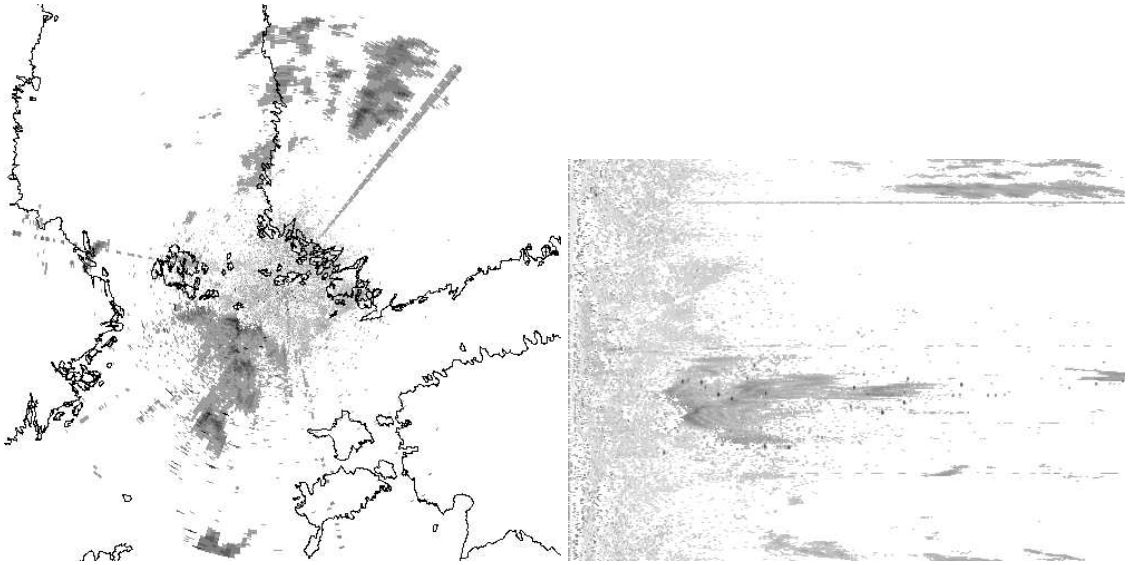
A related problem is that almost all contemporary weather radars can only measure at one elevation angle at a time. Depending on the scan strategy and the antenna's rotation speed, the time it takes to collect a full volume scan can be several minutes. In some weather situations, like rapidly-developing thunderstorms, the resulting volume will contain spatially offset data in the vertical dimension due to the time lag between consecutive scans. A solution to this problem is through the use of phased-array antennas which are capable of transmitting and receiving with several lobes at different elevation angles simultaneously. Such technology was evaluated during COST 717 "Advanced Weather Radar Systems - 1993-97" (Collier 2001), but is not yet in widespread use.

The "real" problem when it comes to polar data is *access* to it. In many radar networks, polar data are the lowest level data potentially available. When it comes to our ability to introduce quality control algorithms, to improve the quality and accuracy of radar data, the earlier in the production chain we can receive data, the better. Due to the radical change to data's characteristics when transforming them to cartesian grids, many algorithms perform best in polar space. An example from (Koistinen et al. 2003) is given in Figure 1. Our ability to further improve the quality of data in a large heterogeneous network comes with the international exchange of polar volume data. If this is enabled, data from any radar in the network can be managed in a common and controlled way, providing the potential to raise the quality of the resulting products.

2 References

Collier, C. G. (Ed.), 2001. *COST Action 75 - Advanced weather radar systems - 1993-97. Final report*. Luxembourg: European Commission. EUR 19546. 362 pp.

Koistinen, J., Michelson, D. B., Hohti, H., and Peura, M., 2003. Operational Measurement of Precipitation in Cold Climates. In Meischner, P. (Ed.), *Advanced Applications of Weather Radar*, Chapter 3. Springer. 340 pp.



(a) Cartesian image; inverted dBZ gray-scale.

(b) Original data in polar coordinate system plotted as a b-scan.

Figure 1: A lowest elevation PPI image contaminated by AP: sea clutter (cloud-like speck in the southwest), emitter lines (south-southeast and west-northwest), ships (distinct specks of high intensity). The only actual precipitation is in the north-northeast. The image also contains low-intensity speckle noise, sun (the continuous line in the northeast) and insects (near the radar). Radar Korpo at 01:30 UTC on July 9, 2002.