Master Extra Project Proposal (15ECTS)

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Objective :

1. Use the monochromatic and homogeneous (constant velocity) atmosphere model to form the time domain signal required for Doppler processing for a scanning radar with a very slow angular rotation speed in azimuth at a fixed elevation. Calculate the radial Doppler velocity using classical technique of Discrete Fourier Transform (DFT).
2. To find horizontal (u, v) and vertical components (w) of the wind velocity from the radar retrieved radial velocity (v_r) from an azimuth scanning radar with a very slow angular rotation speed at a fixed elevation.
    a. $v_r = u\cos(\theta)\cos(\varphi) + v\cos(\theta)\sin(\varphi) + w\sin(\theta)$
    b. θ is the elevation angle in [rad] from the ground and φ is the azimuth angle in [rad].
3. Use the same techniques of point no. 2 by increasing the rotation speed of the radar in azimuth.
4. (Optional) Use the algorithms developed in point no. 2 to the real data of Max3D/MESEWI and validate the results.

Literature for reference:

1. Schwiesow, R. L., Köpp, P., & Werner, C. (1985). Comparison of CW-Lidar-Measured Wind Values Obtained by Full Conical Scan, Conical Sector Scan and Two-Point Techniques. *Journal of Atmospheric and Oceanic Technology*, *2*(1). https://doi.org/10.1175/1520-0426(1985)002<0003:COCLMW>2.0.CO;2
2. Qiu, X., Xu, Q., Qiu, C., Nai, K., & Zhang, P. (2013). Retrieving 3D Wind Field from Phased Array Radar Rapid Scans. *Advances in Meteorology*, *2013*. https://doi.org/10.1155/2013/792631