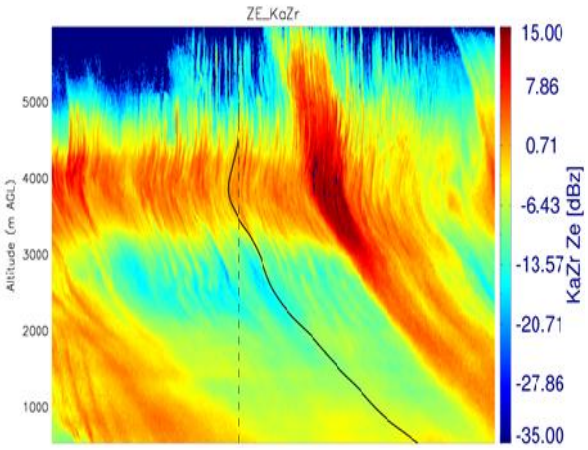
TOPICS FOR MASTER AND BACHELOR THESES

AG OPTIMIce (updated 08/2018)

(If you are interested or want to know more details about the topics, ask Dr. Stefan Kneifel, Room 3.103, skneifel@meteo.uni-koeln.de)

TOPICS FOR MASTER – THESES

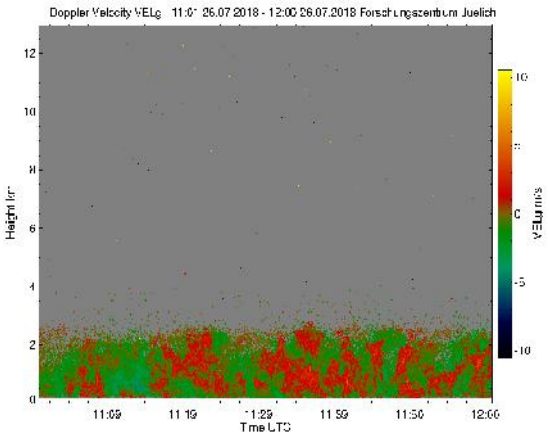
1) Fall streaks: How variable is precipitation within a cloud?



Background: When you look into radar observations of precipitating clouds, you will find typical structures that are often related to a phenomenon called fall streaks. Fall streaks are simply a result of the particles' fall velocity and the wind shear within a cloud; they are often responsible for the temporal variation of rainfall on the ground. Knowing the horizontal wind profile and the particle fall velocity from the radar, one can easily simulate the expected fall streaks (see black solid line in the figure) and analyze the particle properties within and outside the streak.

Tasks: Analyze a day of the TRIPEx campaign containing typical fall streaks and for which horizontal wind profiles from radiosonde ascents are available. Simulate the according fallstreak structures with your own IDL, MatLab or Python program. Analyze radar observables like reflectivity and higher radar moments along the fall streaks and along standard vertical lines. How large is the variability introduced by the fall streaks? How well do your simulated streaks match the observed structures?

2) Ho fast do insects fly?



Background: When you look in cloud radar data on a cloud-free summer day, there is a lot of signal coming from insects in the boundary layer and often also aloft (image shows cloud radar measurements of vertical motion of insects). Those insects are not just standing still in the air but are also advected with the atmospheric wind. Weather services thus plan to assimilate this clear-air radar wind field into models. However, there is still the question how large is actually the insect's individual motion? Are insect motions all random and thus not a big issue for using them as wind tracers? Or are they "organizing" their flights in certain ways?

Tasks: You will analyze data from our cloud radar and wind lidar at the JOYCE site. The radar can only see the insects while the wind lidar is dominated by the aerosols. By matching the vertical and horizontal wind measurements of both instruments, the residual should be the insect individual motion characteristics.

THEMEN FÜR BACHELOR - ARBEITEN

1) Niederschlagsmessung: Waage, Laser, Radar, welche Methode ist am genauesten?

Hintergrund: Niederschlag am Boden gehört mit zu den wichtigsten Beobachtungsgrößen (z.B. Hydrologie). Dabei werden in-situ Sensoren (z.B. Pluvio (=Waage) oder Parsivel (Laser) Distrometer) aber auch vertikal messende Radare (z.B. Mikro Regen Radar, MRR) für die Bestimmung des Niederschlags an einem Ort eingesetzt.

Aufgaben/Ziel: Sie sollen in dieser Arbeit sowohl die langzeitlichen Regenraten als auch die Tagessummen an Niederschlag von 3 verschiedenen Distrometern (Pluvio, Parsivel, MRR) am Standort JuCol (Jülich) vergleichen und die Abweichung je nach Jahreszeit und Niederschlagsart (konvektiv vs. stratiform) charakterisieren. Je nach Fortschritt des Projektes stehen auch langzeitliche Modellsimulationen des Niderschlags für JOYCE des deutschen Wettervorhersagemodells COSMO sowie Daten einer neuen Reanalyse zur Verfügung, um sie mit den Bodenmessungen zu vergleichen.