The PRISTINE project: Polarimetric Radar simulations with realistic Ice and Snow properties and mulTI-frequeNcy consistency Evaluation

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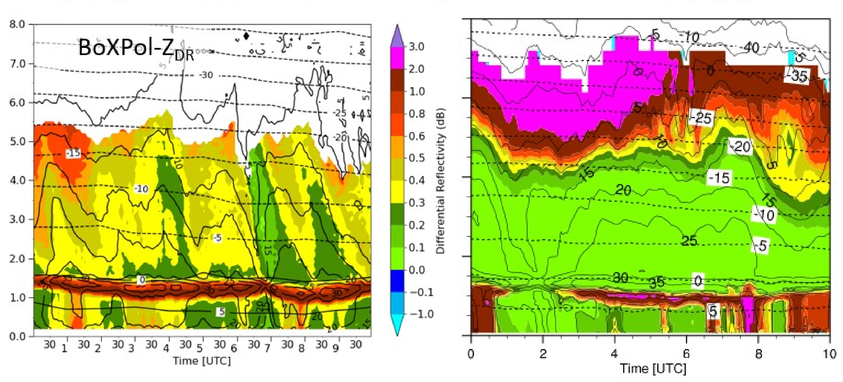
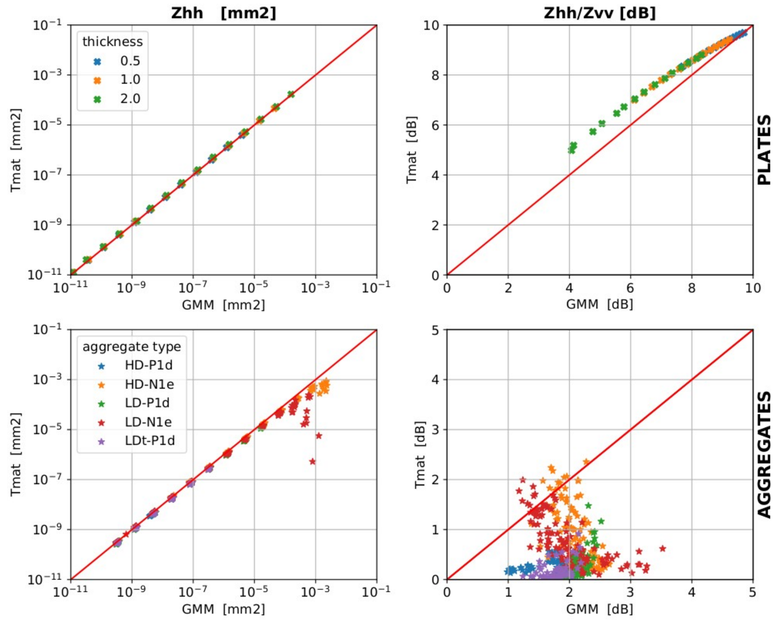
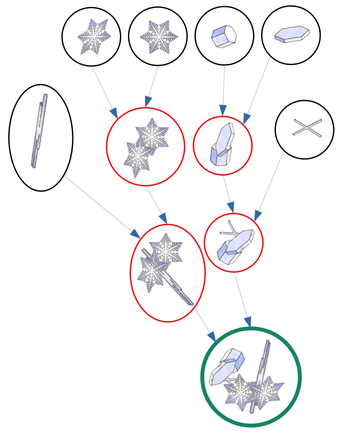


F1: Comparison of measured and simulated Zdr (EMVORADO, ICON model, T-matrix based)

- Radar forward operators have have problems reproducing the polarimetric radar observations
- Mostly due to deficiencies in the T-matrix method for snow aggregates
- Polarimetric databases are sparse and it is difficult to ensure consistency with model

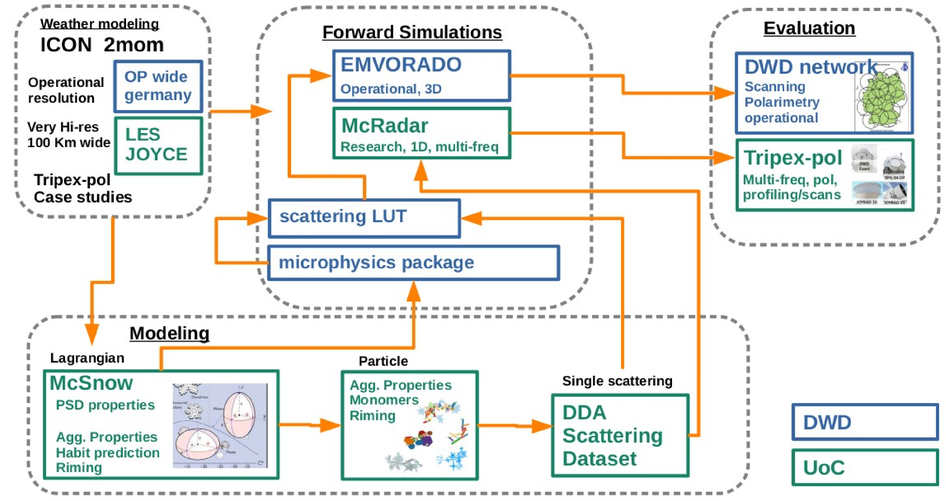


F2: Comparison of simulated Zdr for single particles (ARM [Lu et al 2016] vs T-matrix)

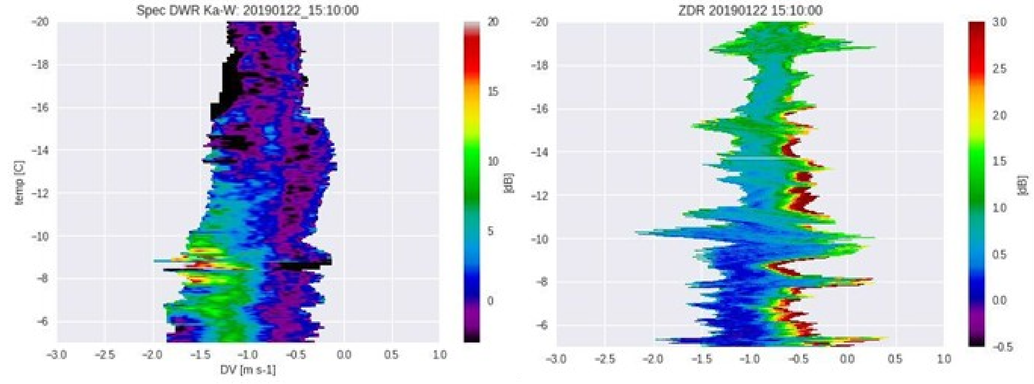


F3: Schematic evolution of the aggregation process. Riming works similarly. We can realize snowflake shapes modeling these processes

- NWP does not resolve snow shape
- Lagrangian super-particle models (McSnow) provide more information such as number and shape of monomers, rime mass and melted fraction
- Single particle snow models simulate snow shapes to be used for scattering computations (DDA)



F4: Conceptual scheme of the PRISTINE project



F5: Example multi-frequency and polarimetric spectral radar observations to be used for model evaluation (TRIPEx-pol)

OUTLINE:

- Run ICON to generate atmospheric profiles to be used to initialize McSnow
- Run McSnow to infer snow particle properties
- Run snow aggregate simulator to generate snow shapes and perform scattering computations
- Compare simulated spectral, multifrequency, polarimetric with TRIPEx-pol observations
- Compile scattering LUTs for the forward modeling of ICON:
  1) ensure consistency with ICON microphysical assumptions;
  2) Unresolved snow properties are statistically connected with model variables (temperature, supersaturation, cloud top temperature, ...)

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