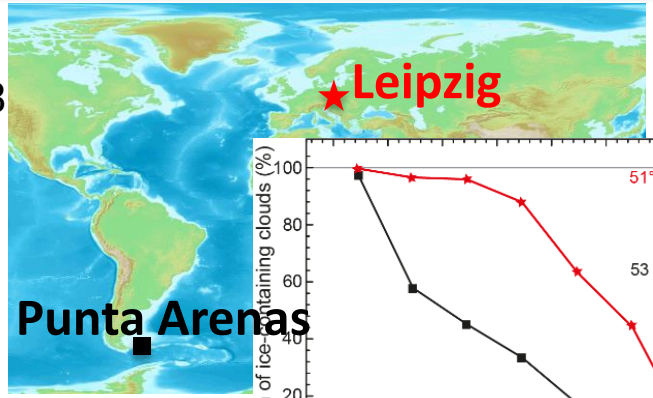
Polarimetry Influenced by CCN aNd INP in Cyprus and Chile (PICNICC) – PhD 2

PROM Kick-Off Meeting - Bonn, October 17-18, 2018

Patric Seifert, Heike Kalesse, Teresa Vogl,
Audrey Teissiere, Johannes Quaas

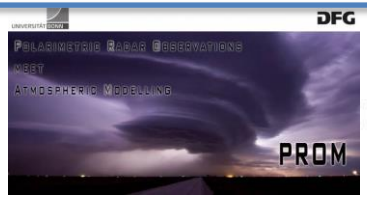


Collaborators:

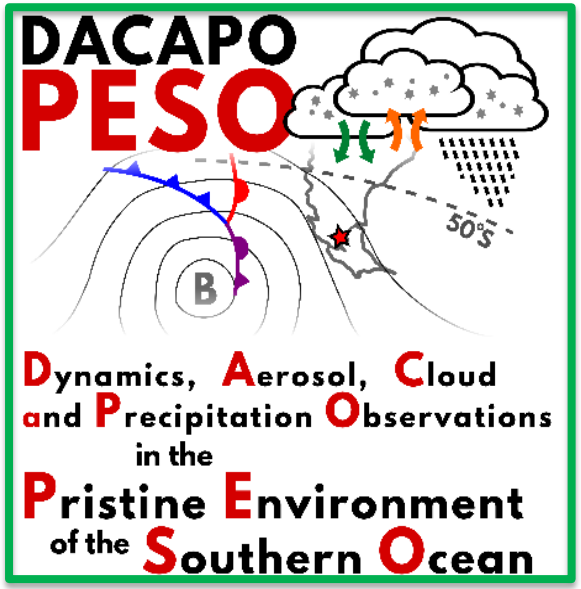
- *Rodanthi Mamouri (Cyprus University of Technology, Limassol, Cyprus)*
- *Boris Barja (University of Magallanes, Punta Arenas, Chile)*

DACAPO PESO

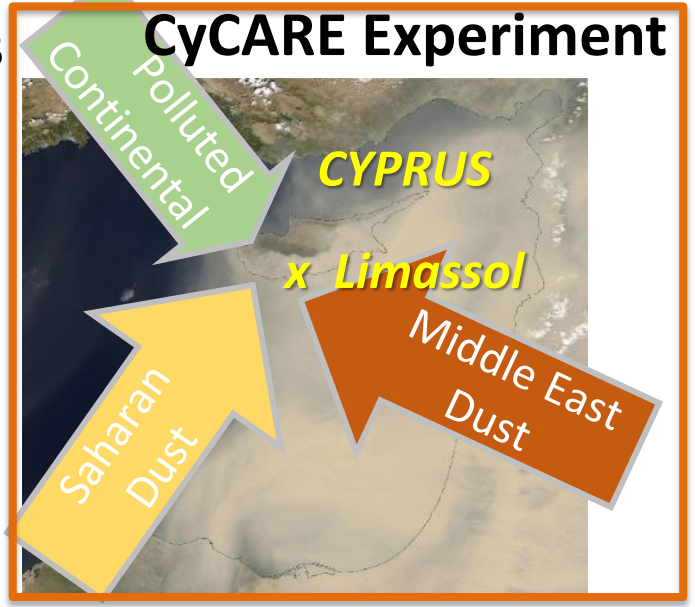
Dynamics, Aerosol, Cloud and Precipitation Observations in the Pristine Environment of the Southern Ocean



TROPOS
Leibniz Institute for Tropospheric Research



Two 1-year experiments for contrasting the microphysical fingerprints of mixed-phase clouds



Not just a PICNICC: Work Plan

Audrey Teissiere:
Oct'17 – Dec'18 in Antarctica

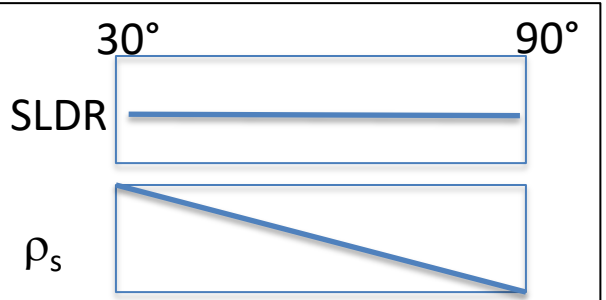
PhD 1: Teresa Vogl **PhD 2: Audrey Tessiere** Joint PhD1/PhD2

WP	Task	Year 1						Year 2						Year 3					
Exp	DACAPO-PESO & DACAPO-LE field experiments																		
1	**Analysis of bulk quantities (polarimetry & multi-wavelengths)**																		
	SLDR analysis																		
	Microphysical fingerprinting (gradients, DWR,Z-V_D-relation)																		
2	**Analysis of Doppler Velocity spectra of *Z* and LDR**																		
	Liquid layer detection																		
	Microphysical fingerprinting																		
3	**Modelling of microphysical processes & interpretation**																		
	Derive radar observables from forward models																		
	ICON-NWP modelling for Cyprus & Punta Arenas																		
	Interpretation of aerosol contrasts																		
	Interpretation of effects of SCL on cloud microphysics																		

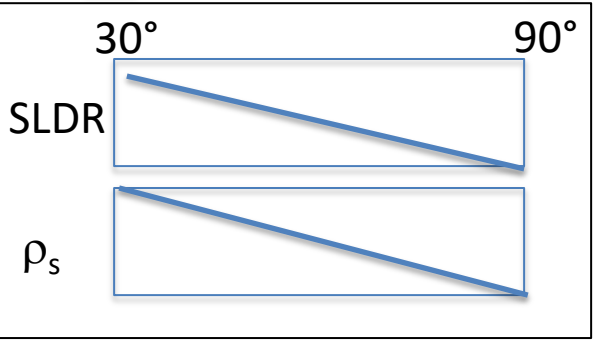
PhD 2: WP 1 – SLDR analysis – **Approach**

- Utilization of scanning (30°-90°) 35-GHz SLDR-mode cloud radar Mira-35
- Elevation (rhi-) scans of polarimetric variables SLDR, ρ_s
- Derive corresponding ellipsoidal shape of hydrometeors

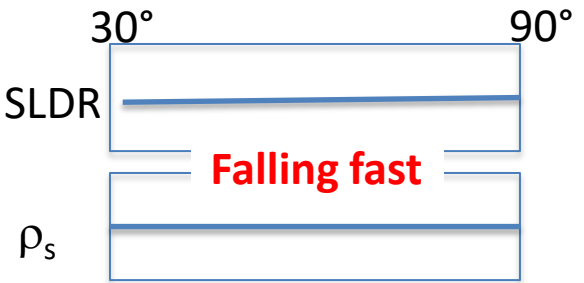
Column



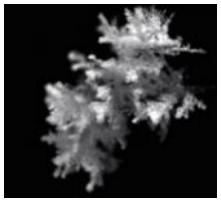
Dendrite

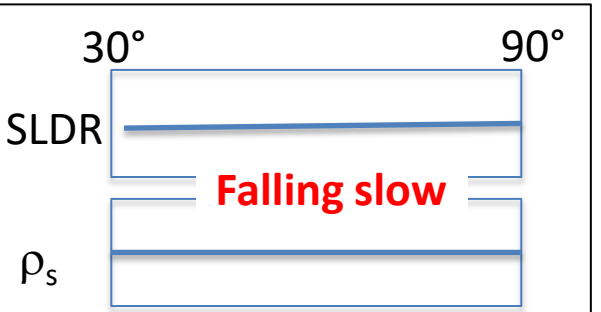


Graupel



Aggregate



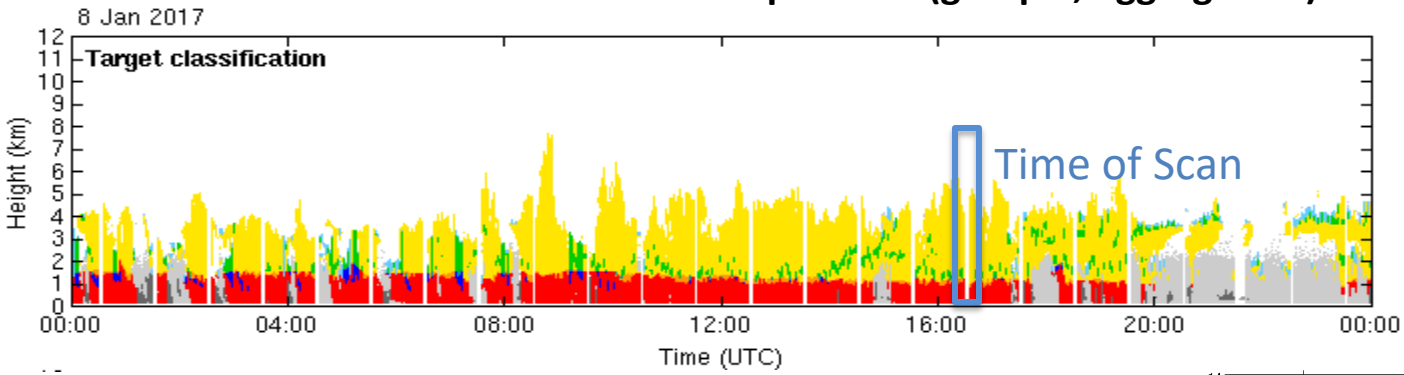


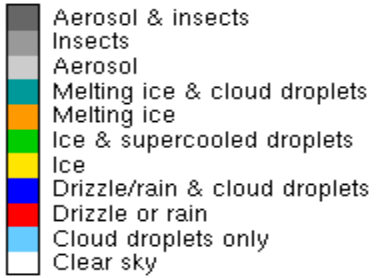
Myagkov et al., AMT, 2015

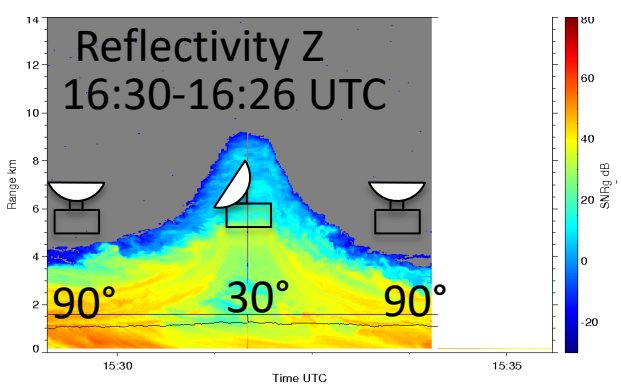
PhD 2: WP 1 – SLDR analysis – **Case Study**

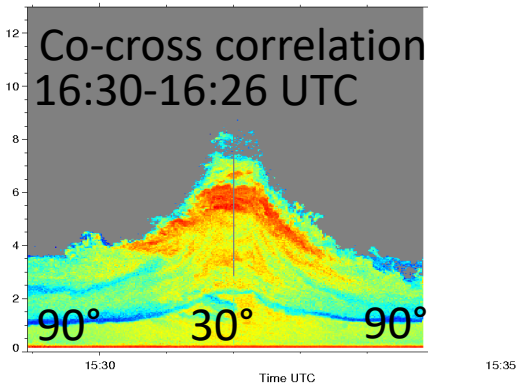
Case Study:
Cyprus, 08 Jan 2017

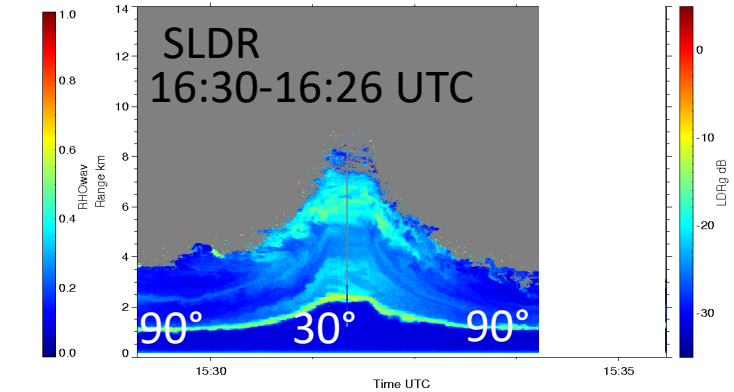
- **oblate particles at cloud top (dendrites)**
- **Isometric particles (graupel, aggregates?) toward cloud base**











PhD 2: WP 3 – Forward Modeling

(1) Cloud Resolving Model **R**adar **Sim**ulator (CR-SIM)

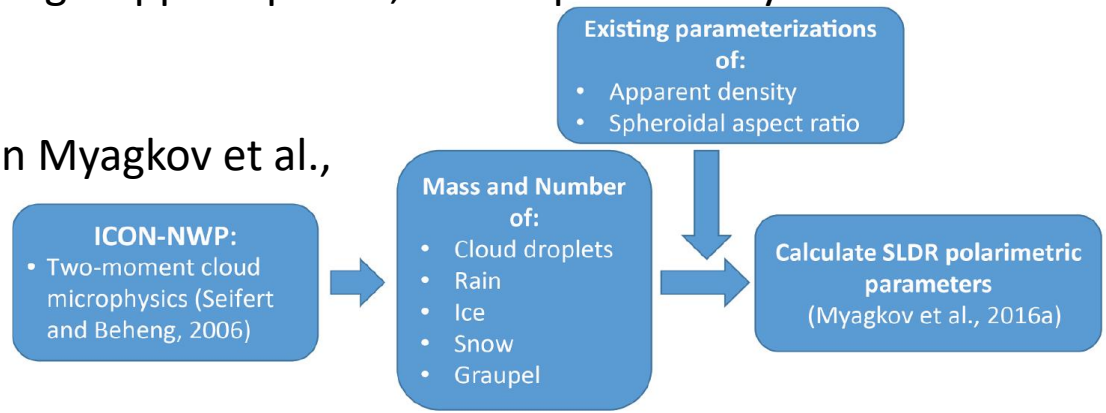
- Microwave forward operator including polarimetric parameters (Z_{hh}, Z_{vv}, Z_{vh}, Z_{DR}, LDR, Kdp), but no Doppler spectra
- 4 weeks of secondment to Stony Brook University, NY for training in CR-SIM
- Potentially: Visit of Mariko Oue (Stony Brook U.; CR-SIM) to Leipzig (TROPOS/LIM)

(2) Passive and **A**ctive **M**icrowave **TRA**nfer model (PAMTRA)

- Microwave forward operator including Doppler spectra, but no polarimetry
- Strong collaboration within PROM

(3) Trial to apply forward model used in Myagkov et al., (2015) for SLDR parameters

- Collaboration with SPOMC project



WP 3 – Interpretation (PhD 1+2; PIs)

1. ICON-NWP output will be averaged in a radius of 20 km around the observation sites (Punta Arenas / Cyprus) to:
   - derive the modeled ratio of aggregation and riming
   - create averaged profiles of forward-modeled radar quantities (*Z*, *V*, LDR, SLDR)

2. Evaluation against averaged observed profiles for different categories of:
cloud top temperature, aerosol burden, precipitation rate, *Z* - and *V*- values and gradients

3. Are there regional differences in the radar observations? Can these be attributed to aerosol variability?

4. Can we identify deficiencies of ICON NWP under certain conditions (e.g., wrt aerosol load)?

5. What can ICON NWP + forward modeling tell us about the required sensitivity in the observations for identification of certain processes (e.g., ratio between aggregation/riming)?