

# **Focussing from global to regional scale processes**

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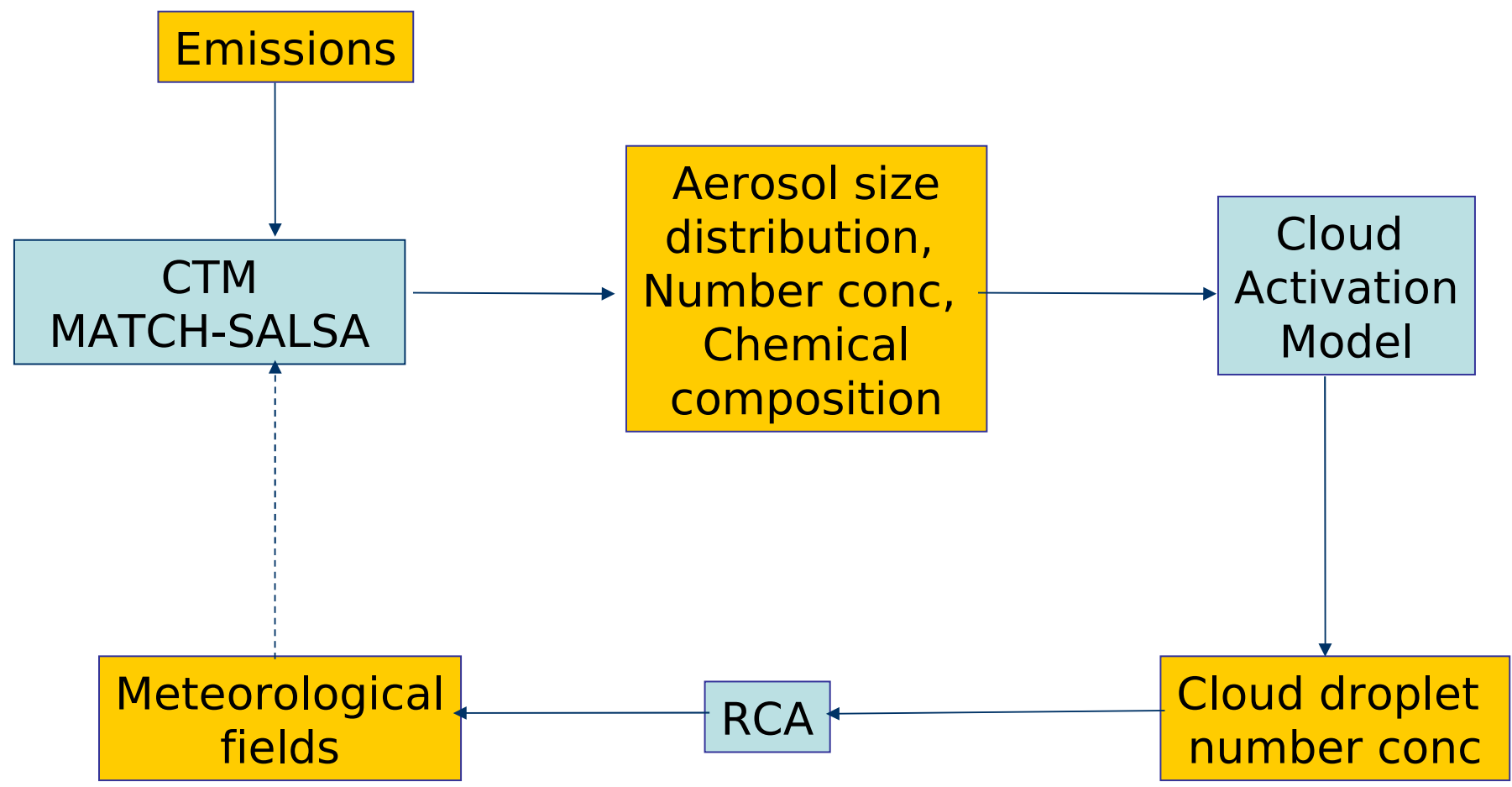
**SMHI**

**21 May 2012**

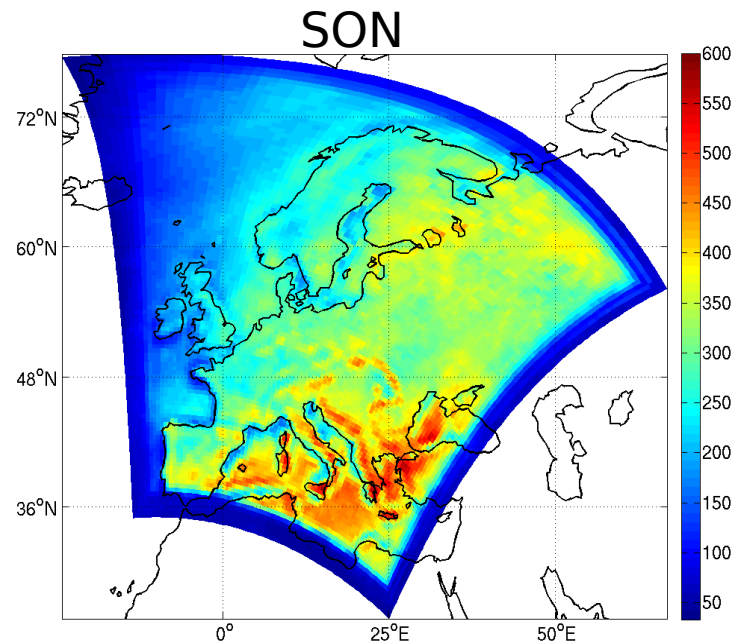
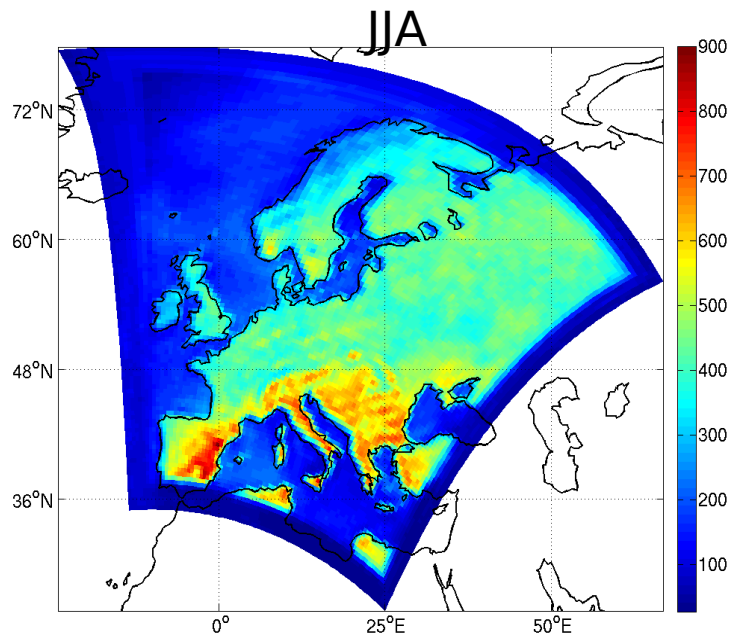
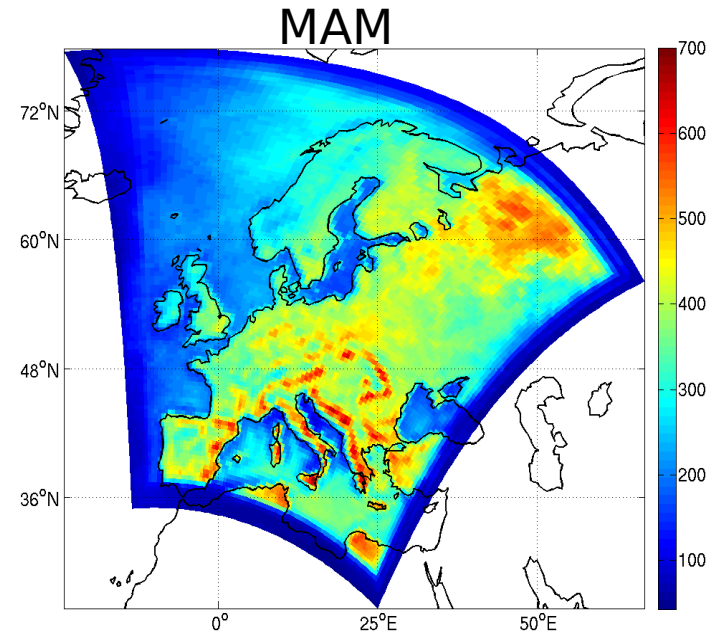
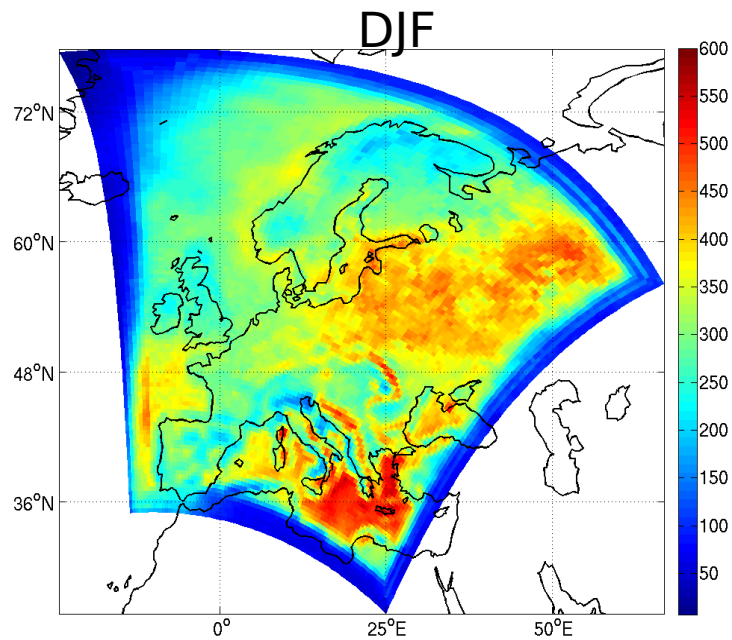
# **How should we reduce the uncertainties in aerosol direct and indirect forcings?**

- Coupling of chemistry transport model that has sophisticated aerosol-cloud treatment to regional climate model.
- Constraining models and verifying processes with satellite data

# Towards 3D aerosol-cloud model in CTM in the framework of CLEO



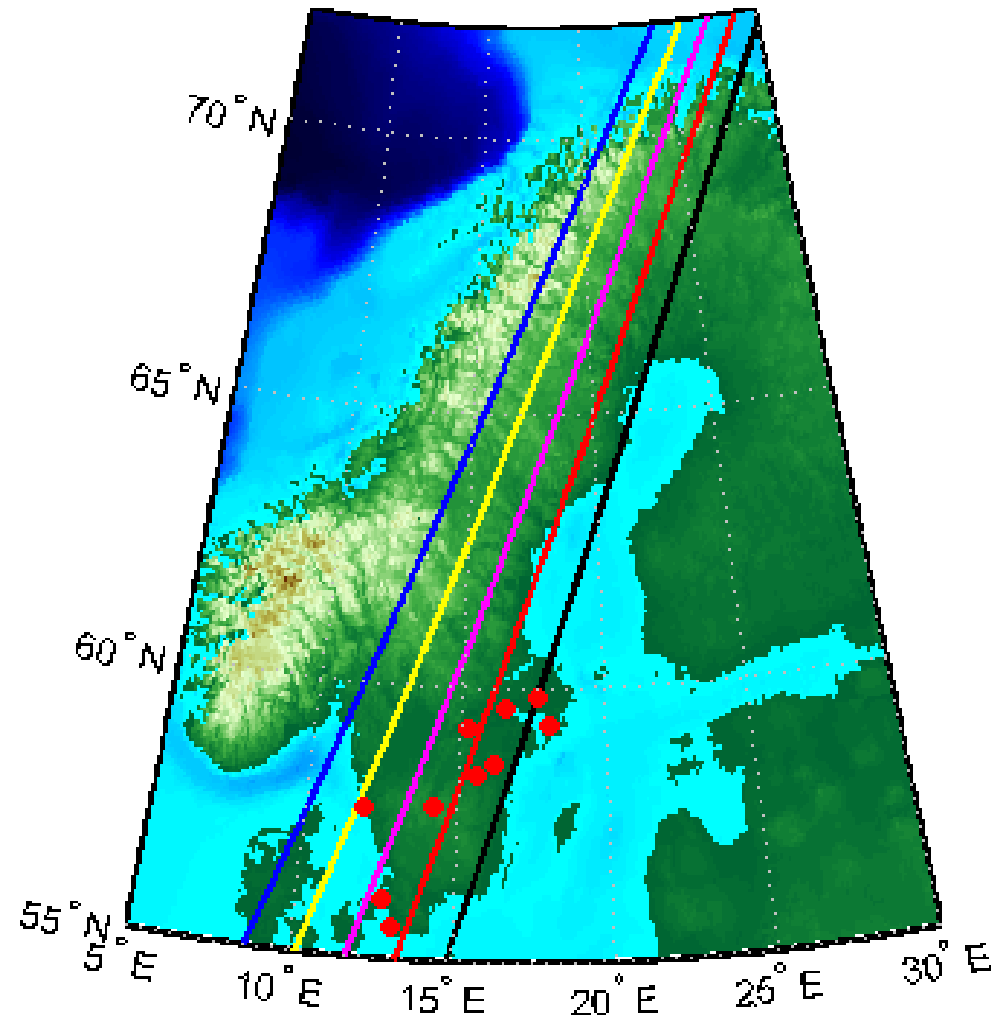
# An example of the seasonality of cloud droplet numbers ( $\text{cm}^{-3}$ )

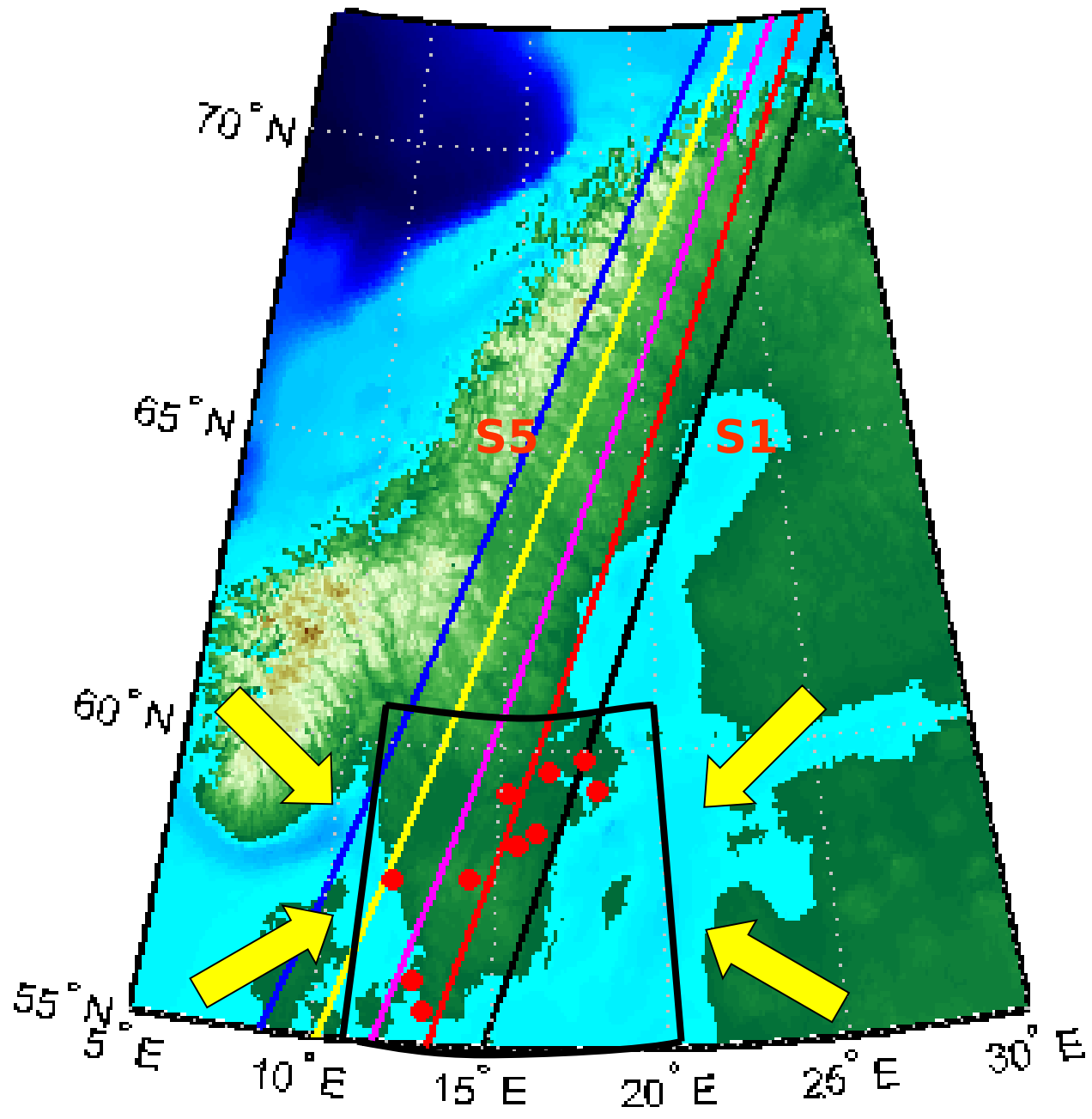


# Using satellites... **CALIPSO over Sweden**

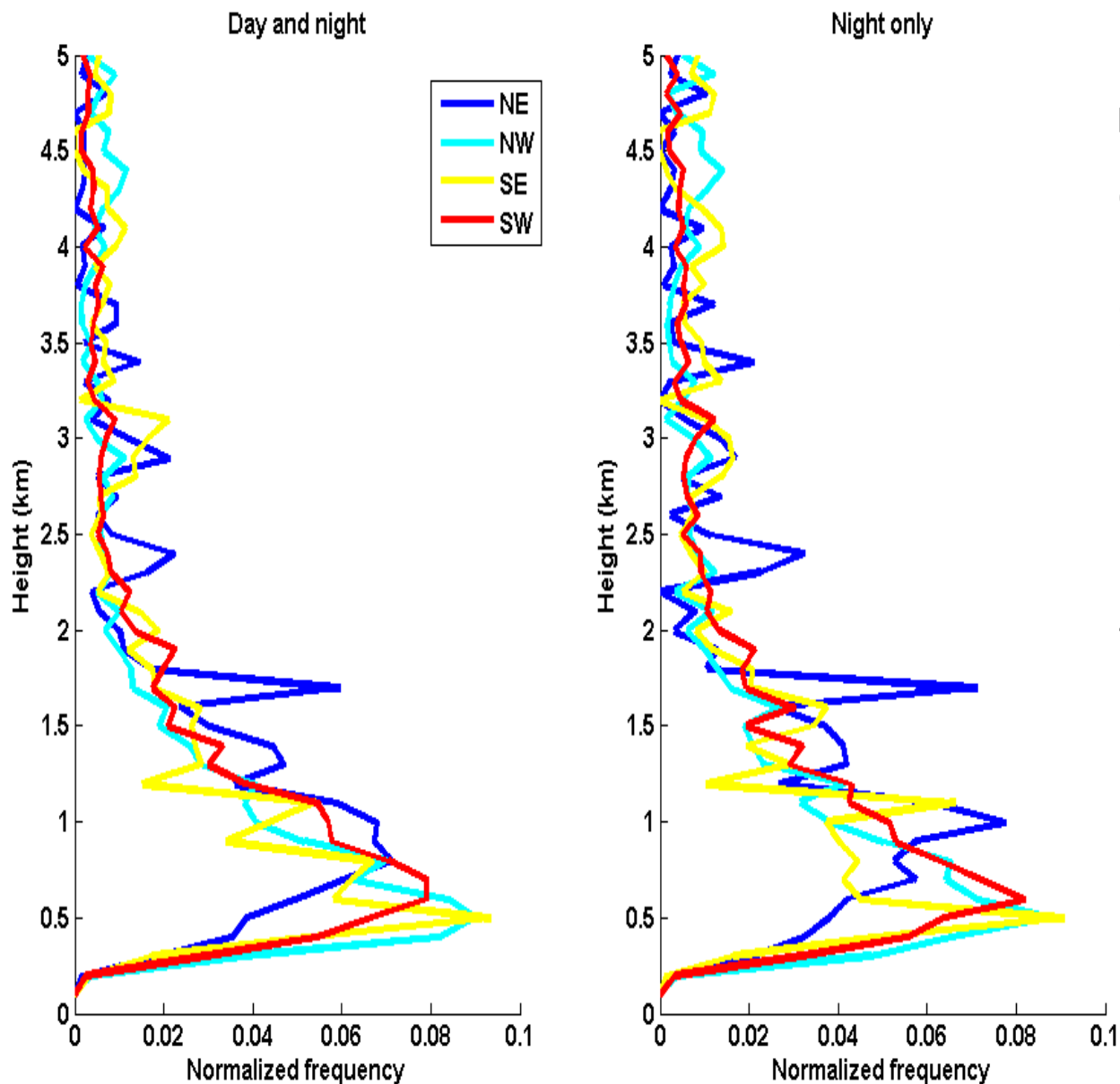
The descending orbits of CALIPSO follow the elongated major-axis of Sweden and passes closely by major populated cities.

The synergy of AIRS and CALIPSO thus opens many opportunities to investigate thermodynamics, aerosols and gases.





# And how does wind direction affect the vertical distribution of aerosols??

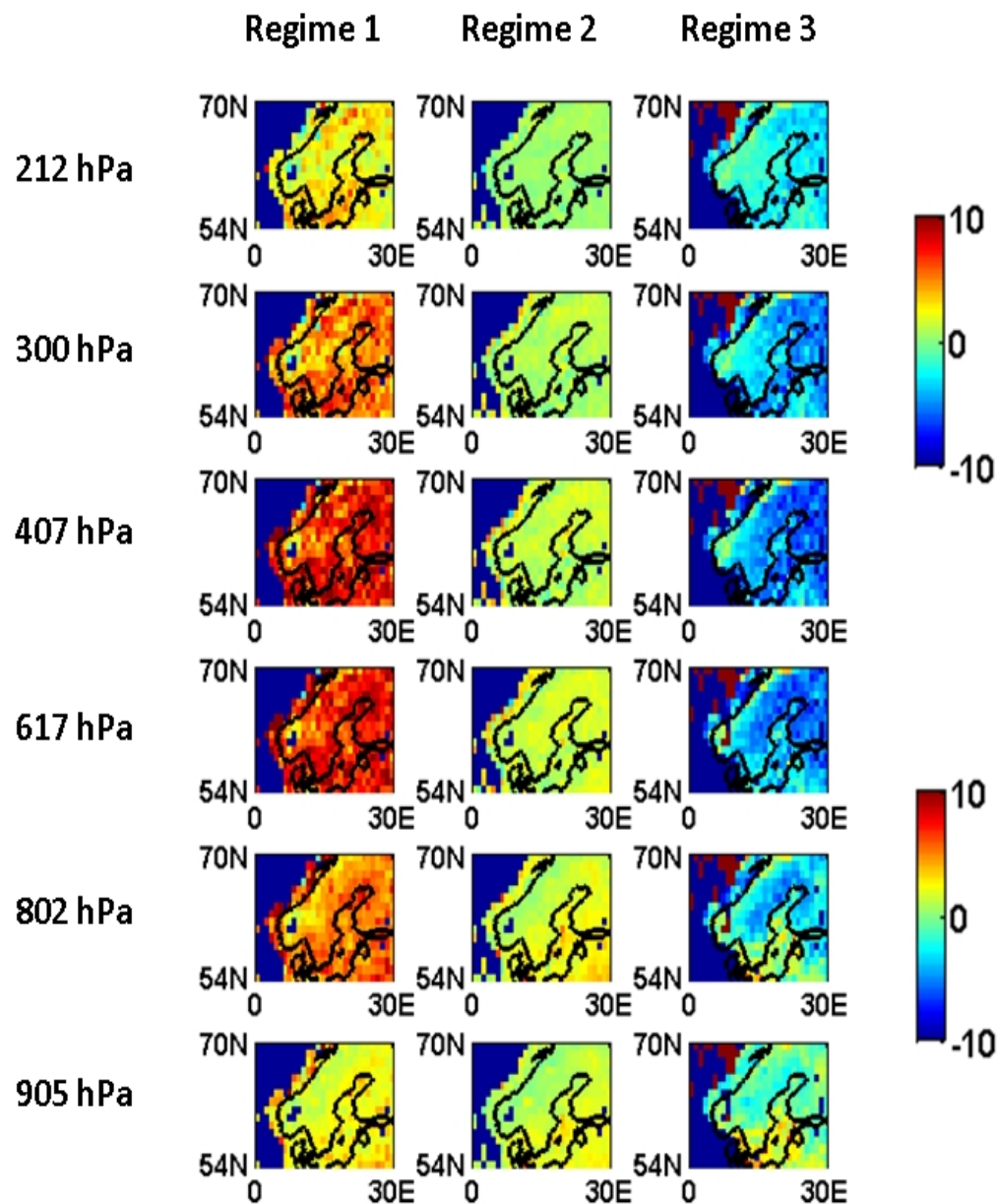


Majority of aerosols are below 2 km irrespective of the wind direction

When the winds are north-easterly (NE), two peaks are seen - one at 1 km and the other at 1.8 km. The former peak is due to the pollution from localized sources and the latter is more likely due to the contribution from long distant transport.

Thomas, M.A., Devasthale, A. and Kahnert, M., *in prep.*, 2012

# Carbon monoxide variability over Sweden and the role of long-range transport



Regime 1:  
Atmosphere is weakly stable  
Strong winds  
Winds are mostly westerly

Regime 3:  
Atmosphere is stable  
Weaker winds

Increase in CO concentration observed in the middle troposphere over Scandinavia (in Regime 1) when we have strong winds from across the Atlantic transporting pollutants from N. America.

Devasthale, D. and Thomas, M.A.,  
*Atmos. Env.*, 2012



# Summary

To reduce uncertainties in aerosol (direct and indirect) radiative forcing, the next generation climate models should strive for a) tight coupling between CTM and RCM and b) better representation of aerosol-cloud interactions.

Models need to be evaluated and satellites play a crucial role in this context.

These two will continue to be the dedicated focus of CLEO.