

Clouds and Precipitation

Selected topics, and how HALO can help.

– Some Appetizers –

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Cirrus, Deep & Shallow Convective Clouds

Life Cycle

- Microstructure of Convective Clouds
- Cirrus and Warm Conveyer Belts

Formation of Precipitation

- Vertical Distribution of Hydrometeors
- Mesoscale Heavy Rain Forecast

Energy Budget & Remote Sensing

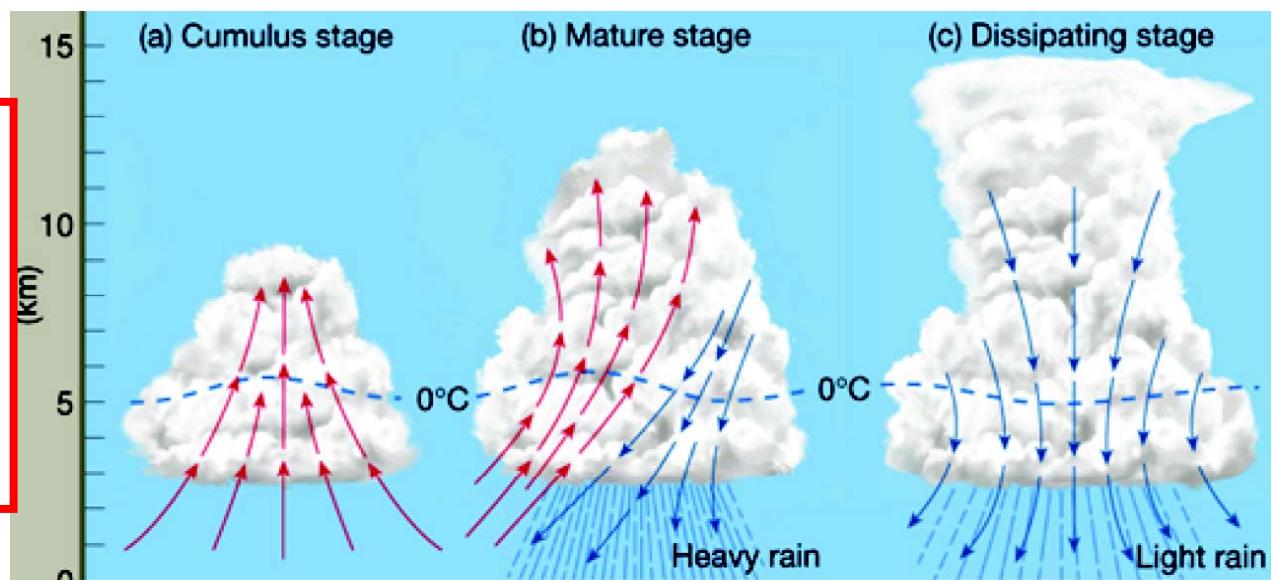
- Indirect Effects
- Microphysical Properties
- Subvisible Cirrus



Source: <http://www.youtube.com/>

Questions:

- How do vertical profiles of microphysical properties evolve?
- Is the aerosol particle background important?



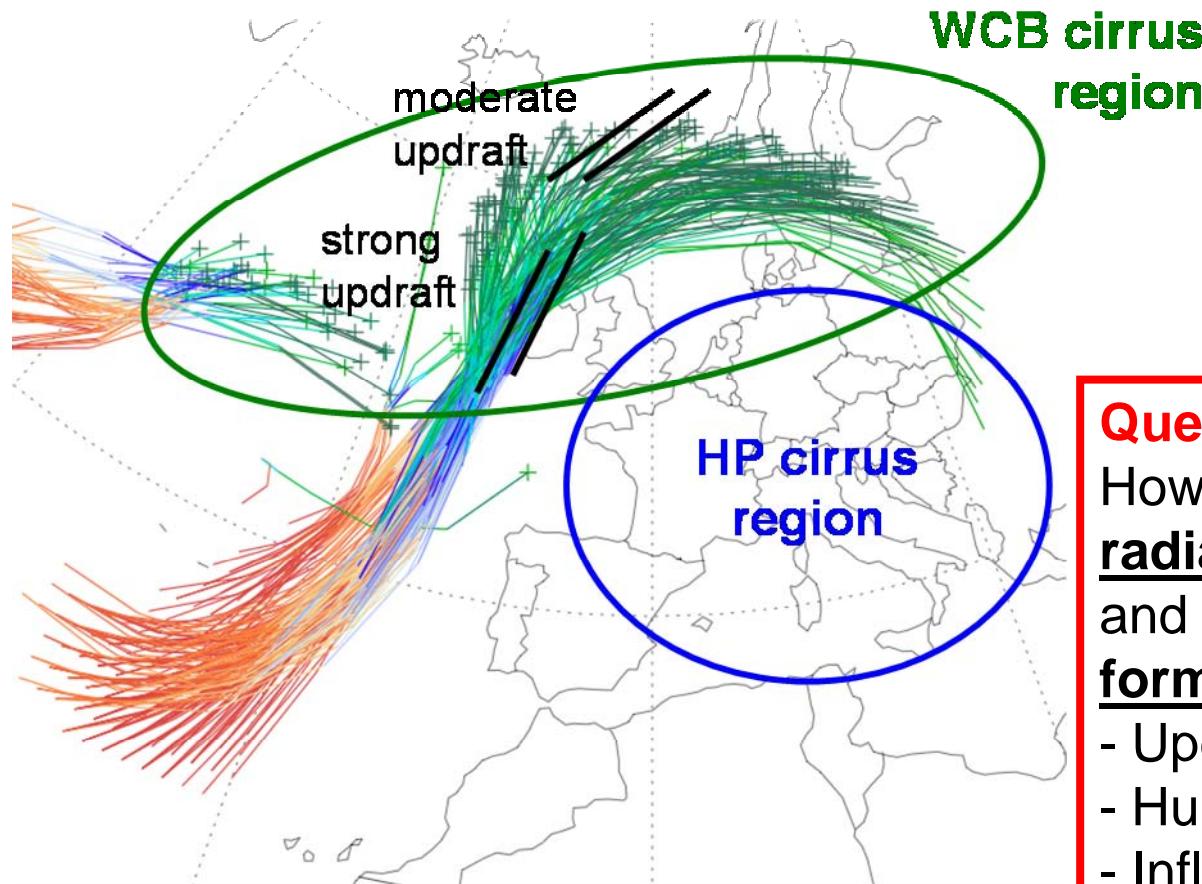
Life Cycle – Microstructure of Convective Clouds (ACRIDICON, NEPTUN, NARVAL)

WCB

Warm Conveyer Belts

HP

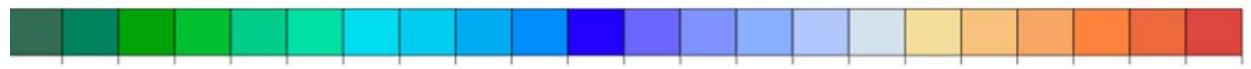
High Pressure System



Question:

How do microphysical and radiative properties of WCB and HP cirrus depend on formation conditions:

- Updraft velocity,
- Humidity, and
- Inflowing aerosol?



0 325 350 375 400 425 450 475 500 525 550 580 610 640 670 700 740 780 820 860 900 940 980

pressure

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Formation of Precipitation

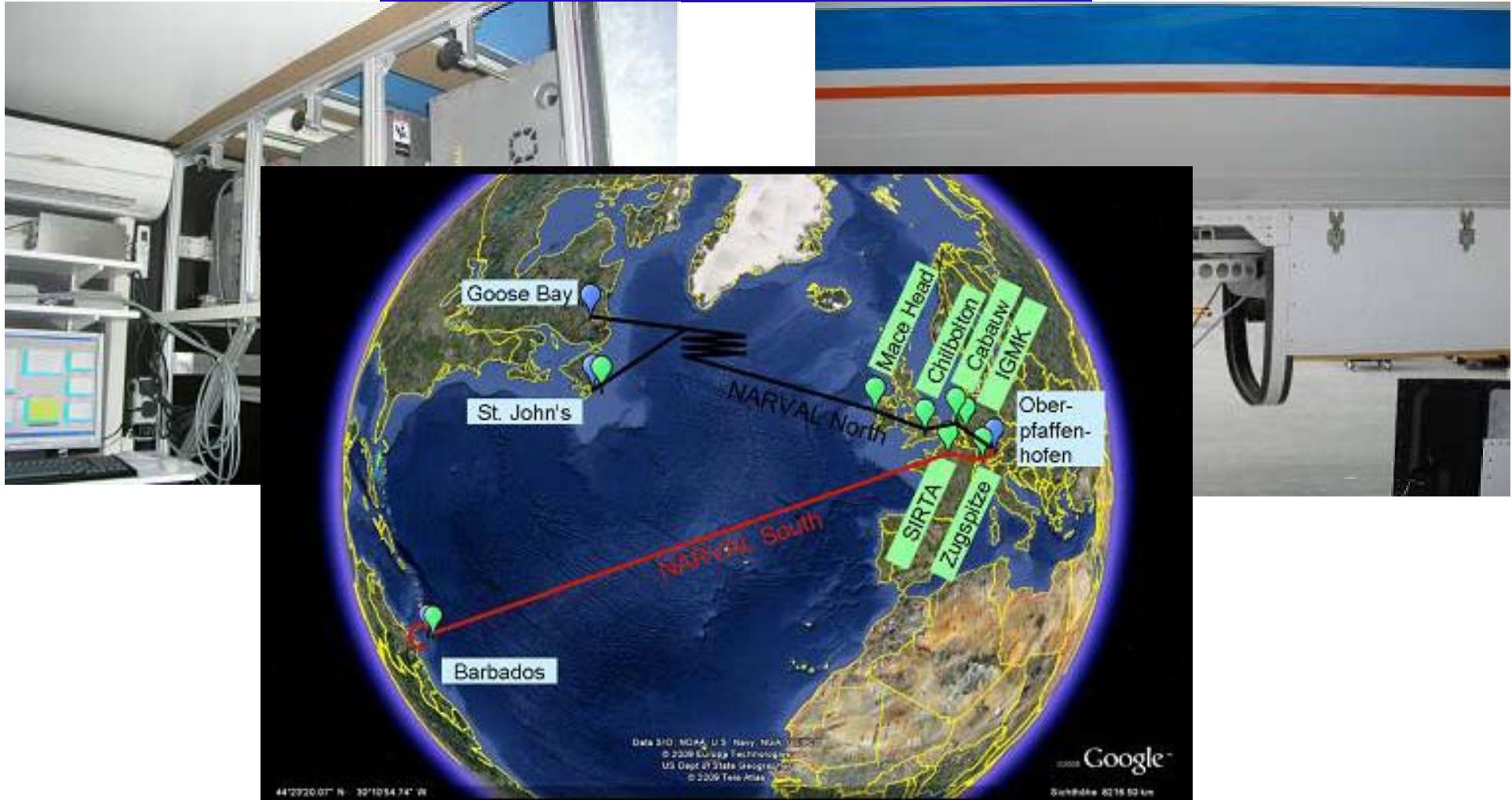
- Shallow Convective Cloud Systems
- Mediterranean Cyclogenesis

Energy Budget & Remote Sensing

- Indirect Effects
- Microphysical Properties
- Subvisible Cirrus

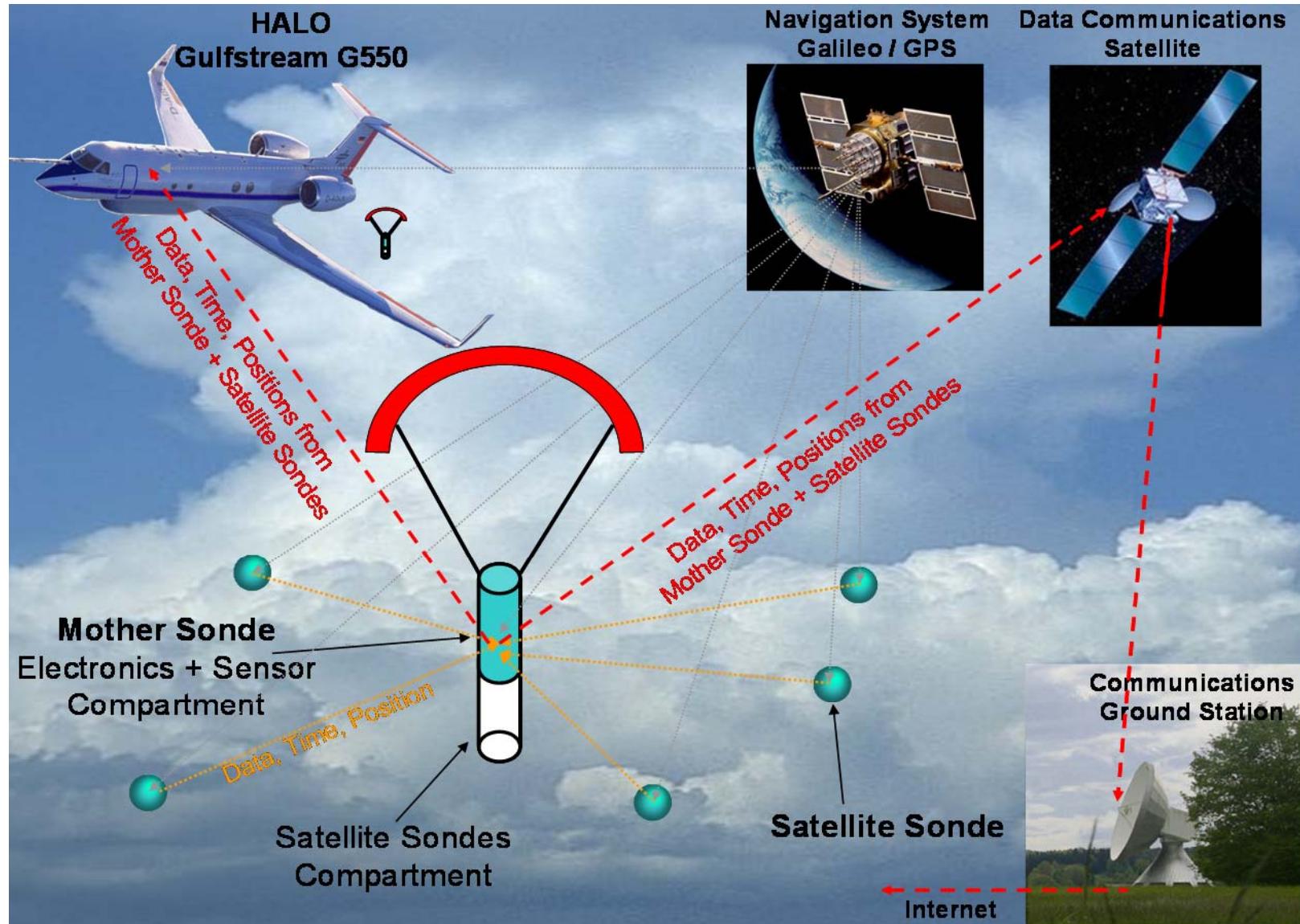
Question: To what extent are **shallow cloud systems** (fair-weather, trade wind area, or post-frontal of extra-tropical cyclones) **precipitating?**

HALO Microwave Package (HAMP) =
Microwave Radiometer + Cloud Radar

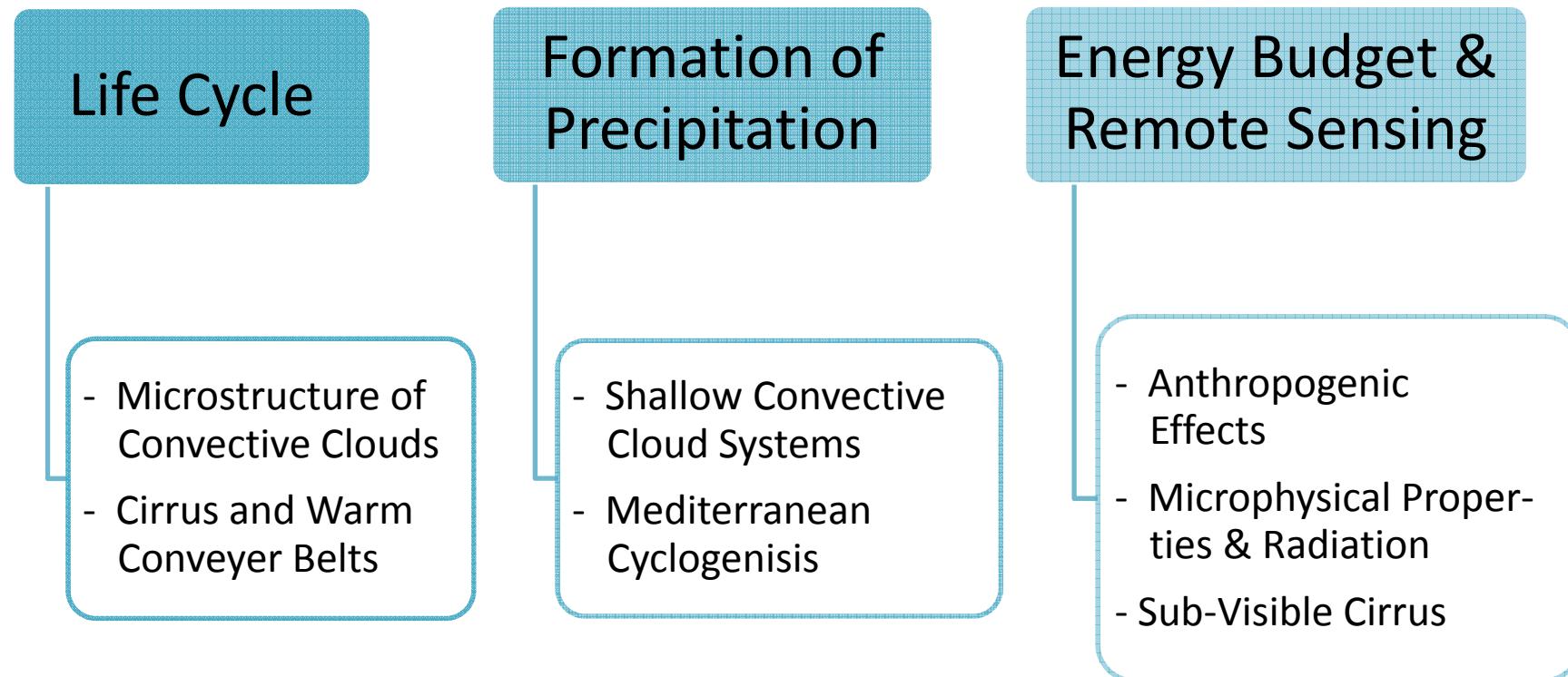


Formation of Precipitation – Shallow Convective Cloud Systems (NARVAL)

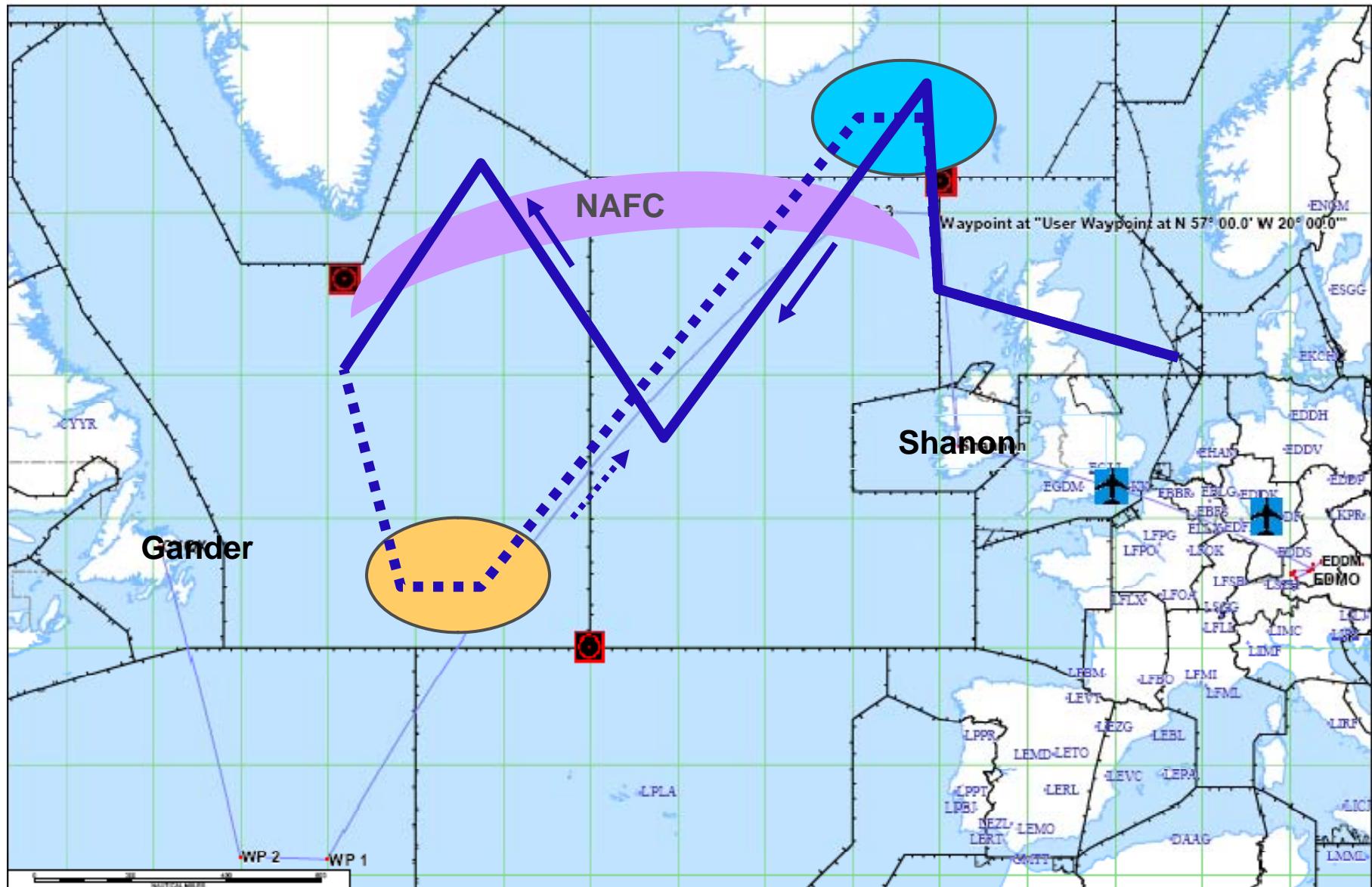
Question: Can we improve the prediction of rainfall caused by pre-frontal rain bands and convective cells triggered by e.g. orography?



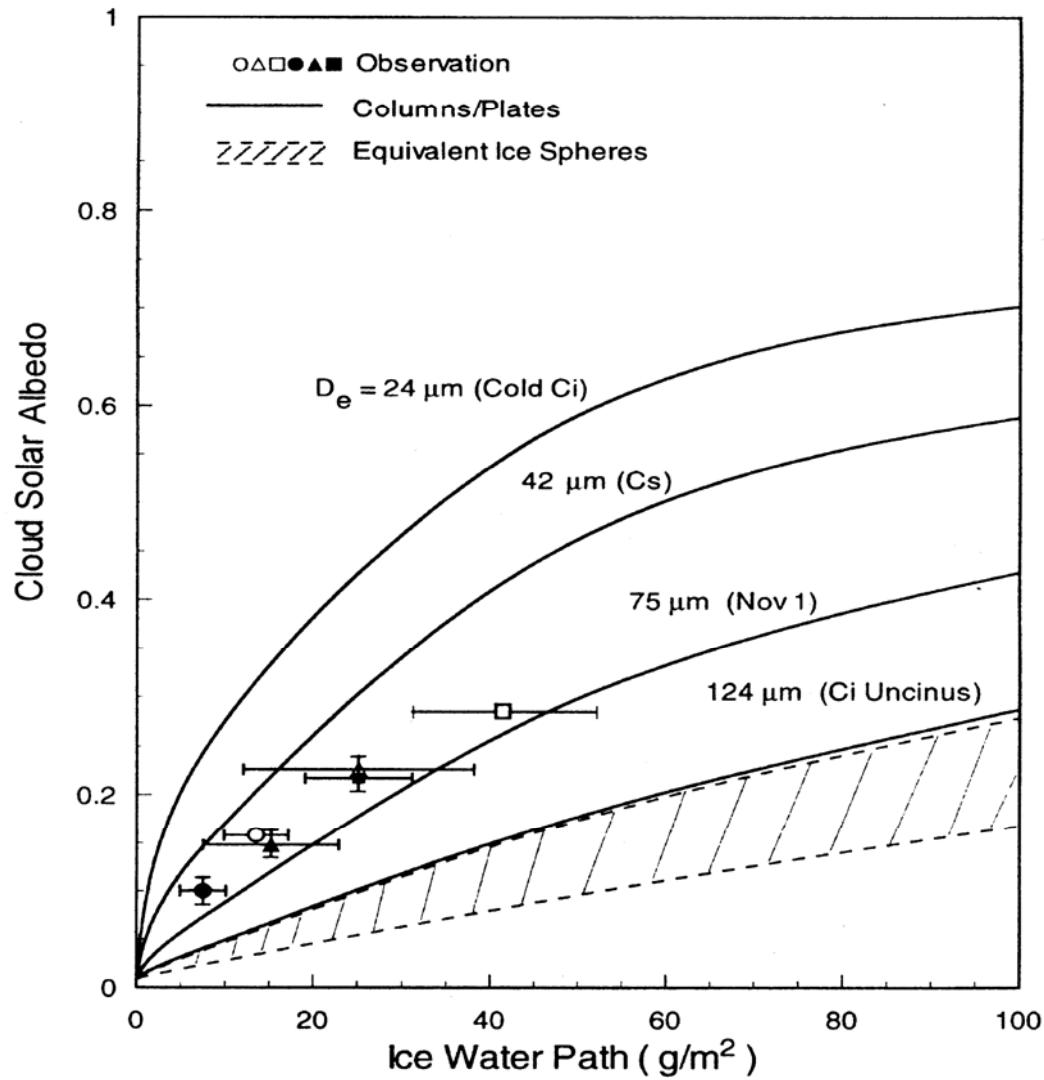
Cirrus, Deep & Shallow Convective Clouds



Question: Can a measurable **diurnal cycle of aviation-induced cloudiness** near the North Atlantic Flight Corridor (NAFC) be verified?

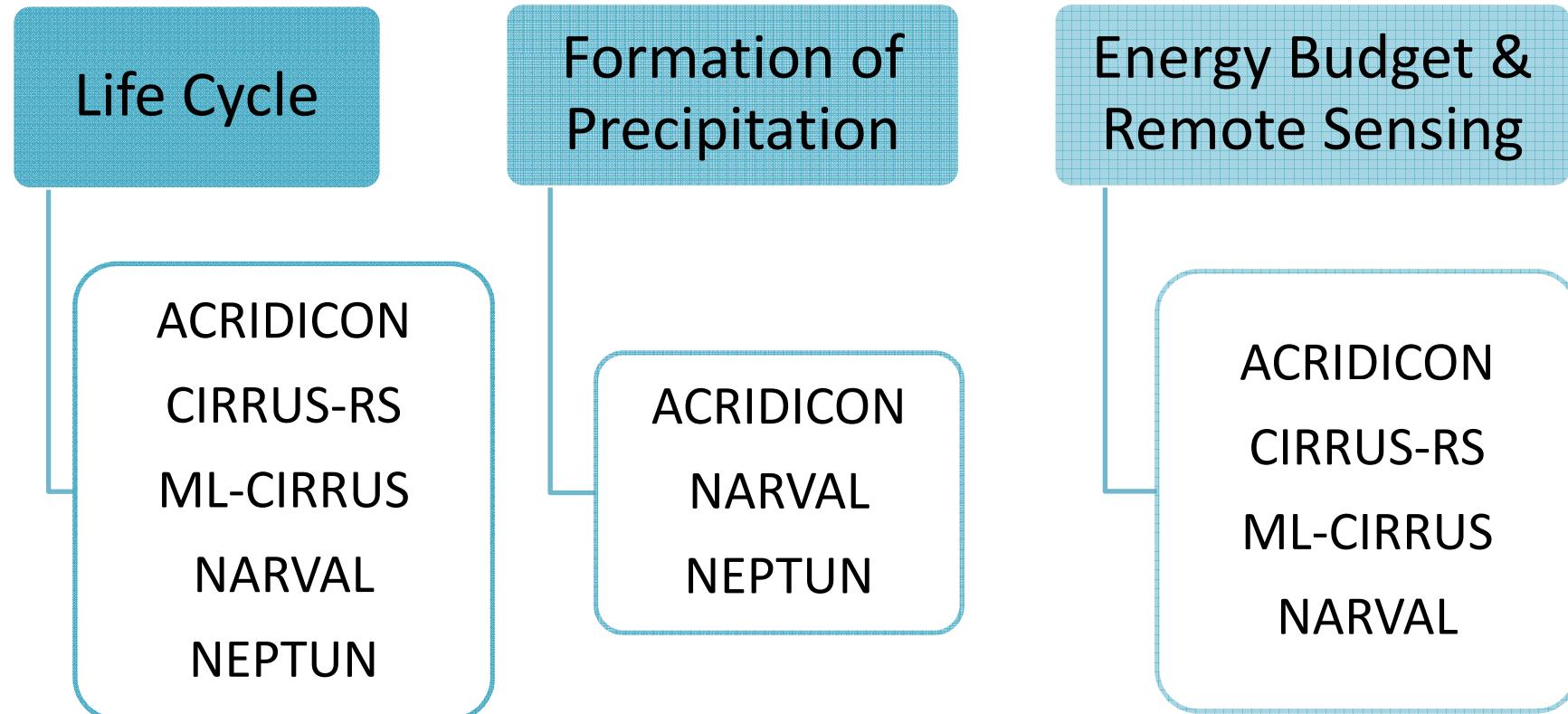


Question: Is there any threshold optical thickness above which the ice crystal shape loses significance in determining the radiative forcing of cirrus clouds?

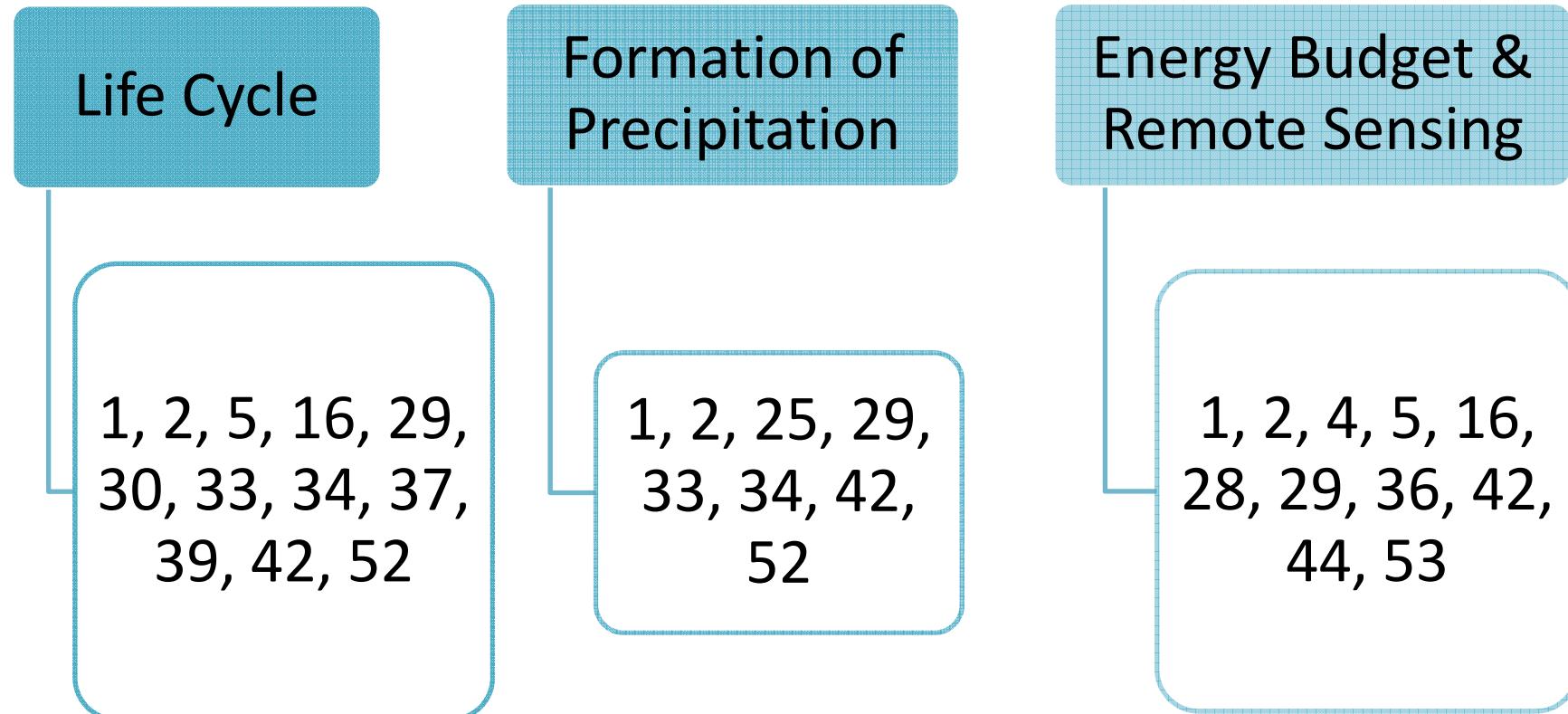


Liou et al. [2000]

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Thanks for your attention.

ACRIDICON	Aerosol, Cloud, Precipitation, and Radiation Interactions and Dynamics of Convective Cloud Systems
CIRRUS-RS	Cirrus – Remote Sensing
ML-CIRRUS	Mid-Latitude Cirrus: Formation, Lifetime, Properties and Radiative Impact of Mid-Latitude Cirrus Clouds
NARVAL	Next-generation Aircraft Remote-Sensing for Validation Studies
NEPTUN	Deep convection and cyclones causing High Impact Weather (HIW) in the Mediterranean