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Satellite Observations of the impact of individual aircraft on ice crystal number in cirrus clouds

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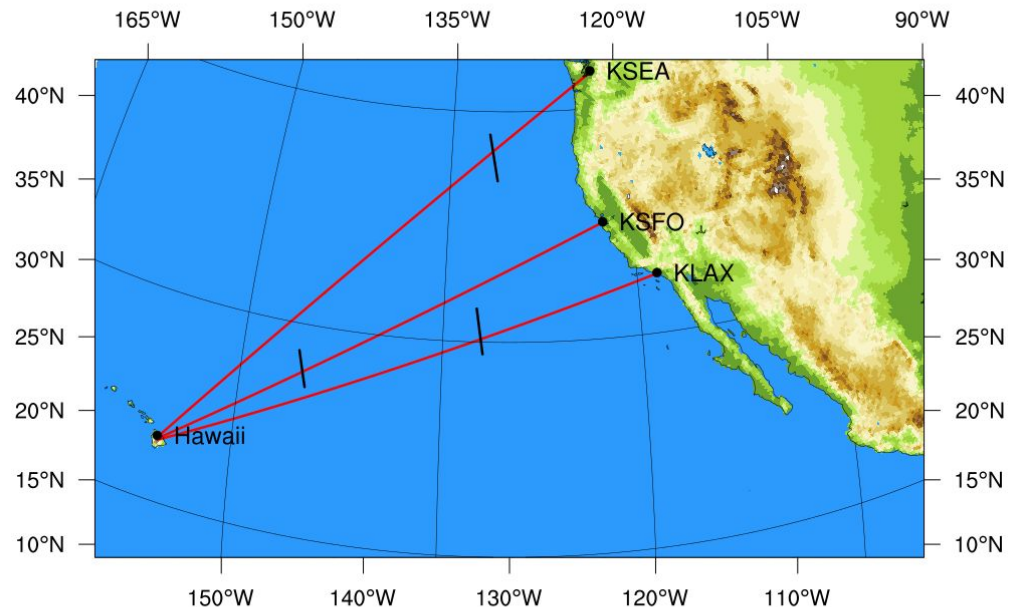
Horizon 2020
European Union Funding
for Research & Innovation



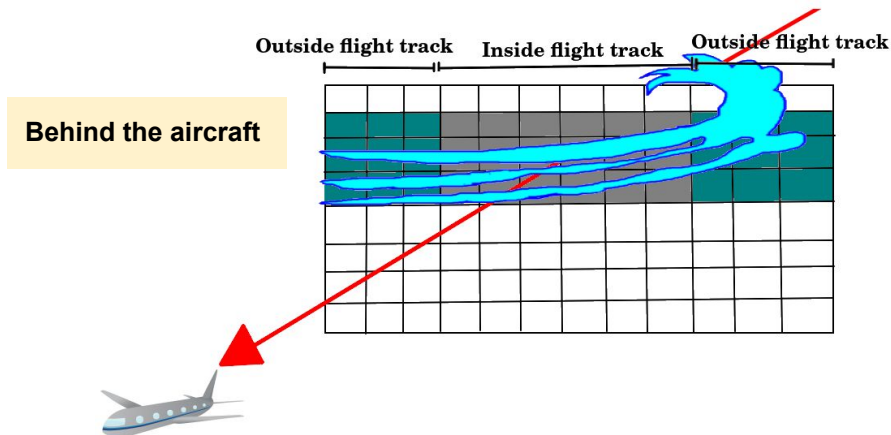
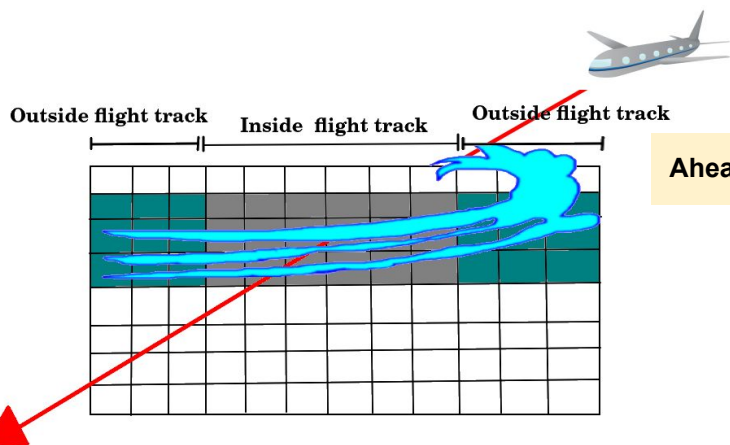
- Intersection between flight tracks and CALIPSO satellite lidar

Data: aircraft

- Commercial aircraft
- Location with time
- West coast of United States and Hawaii
- timespan 2010 and 2011



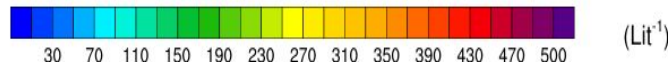
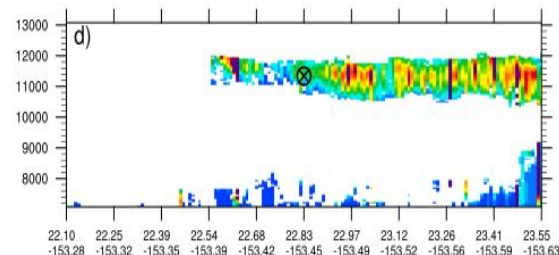
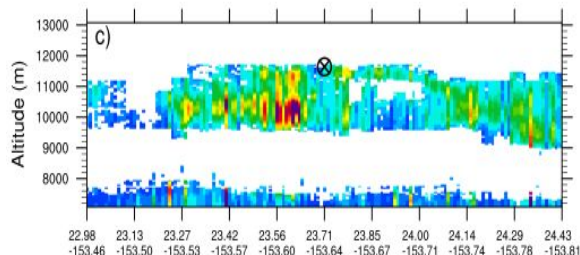
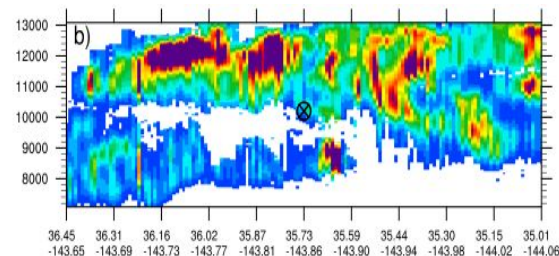
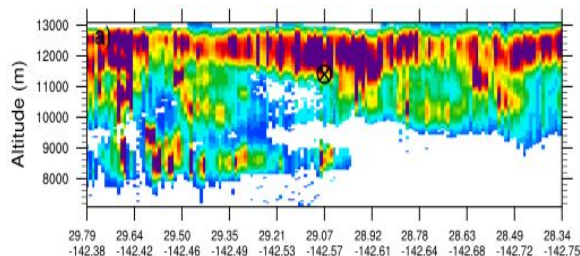
- Time difference between aircraft and satellite
($|\Delta t| < 30$ minutes)
- ahead and behind the aircraft
- Inside and outside the flight track



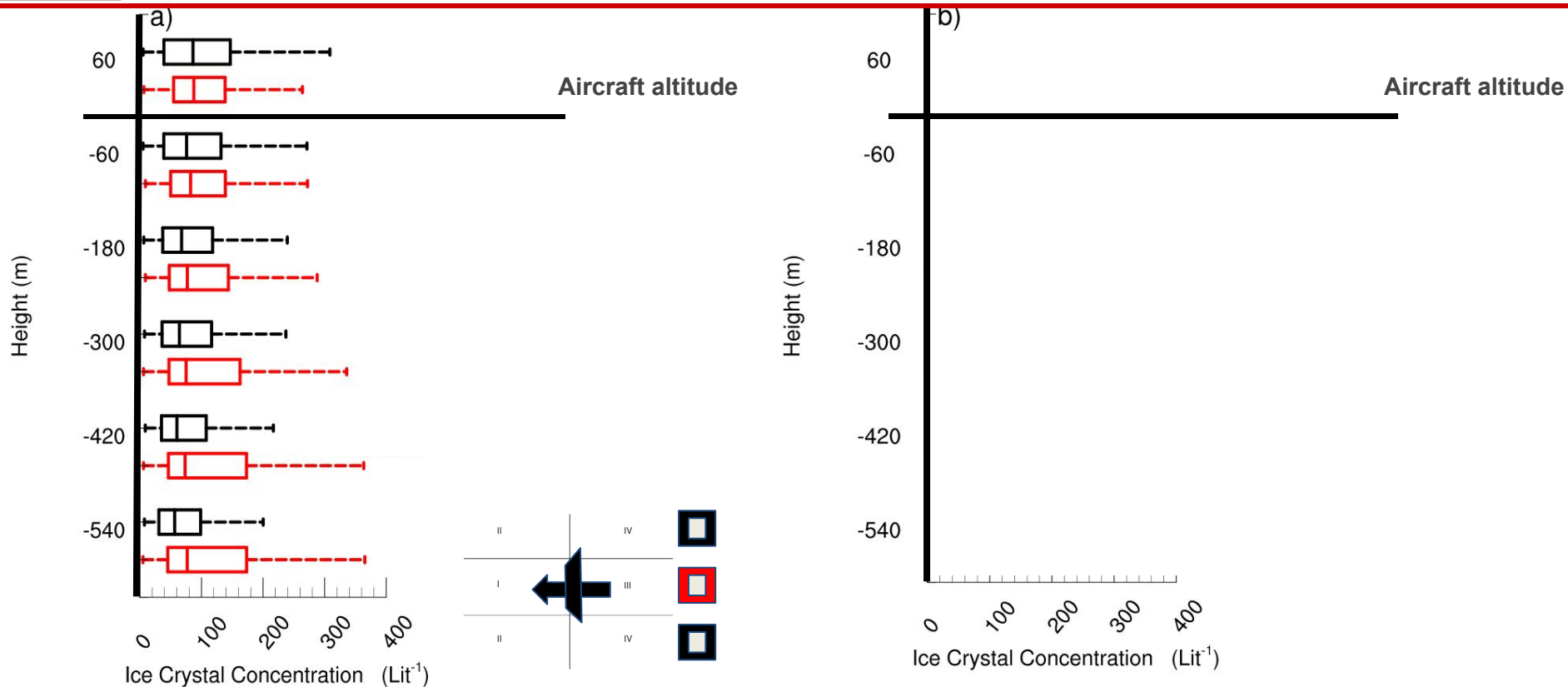
- Presence of cirrus cloud

DARDAR_Nice¹ (LiDAR–raDAR-Number concentration of ICE particles)

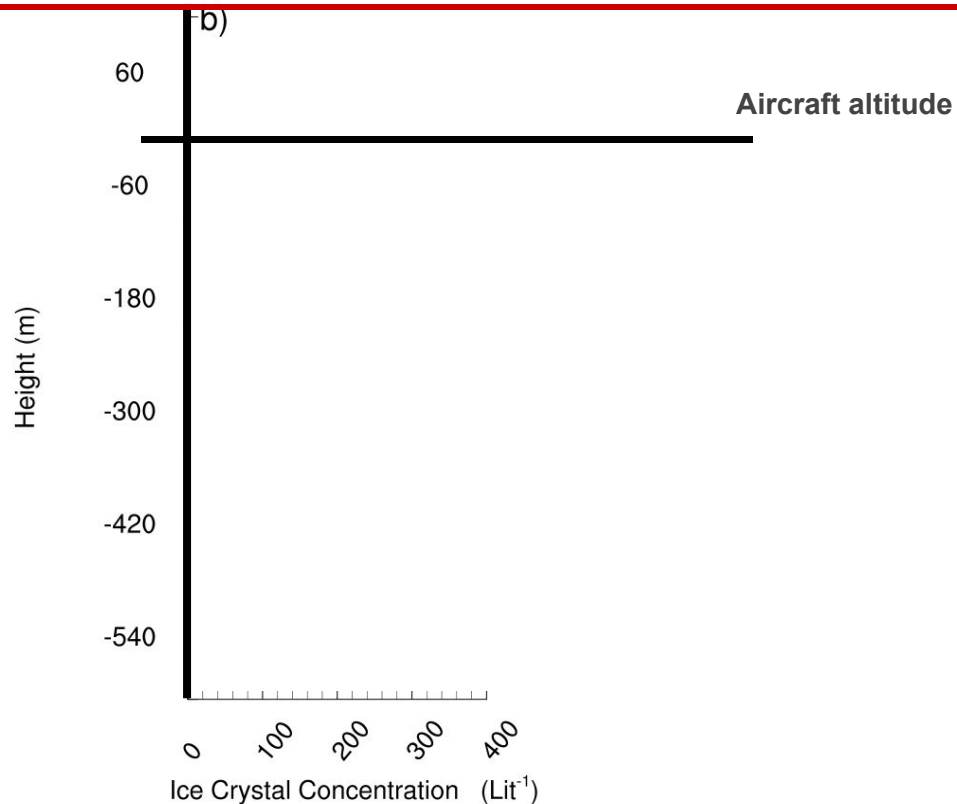
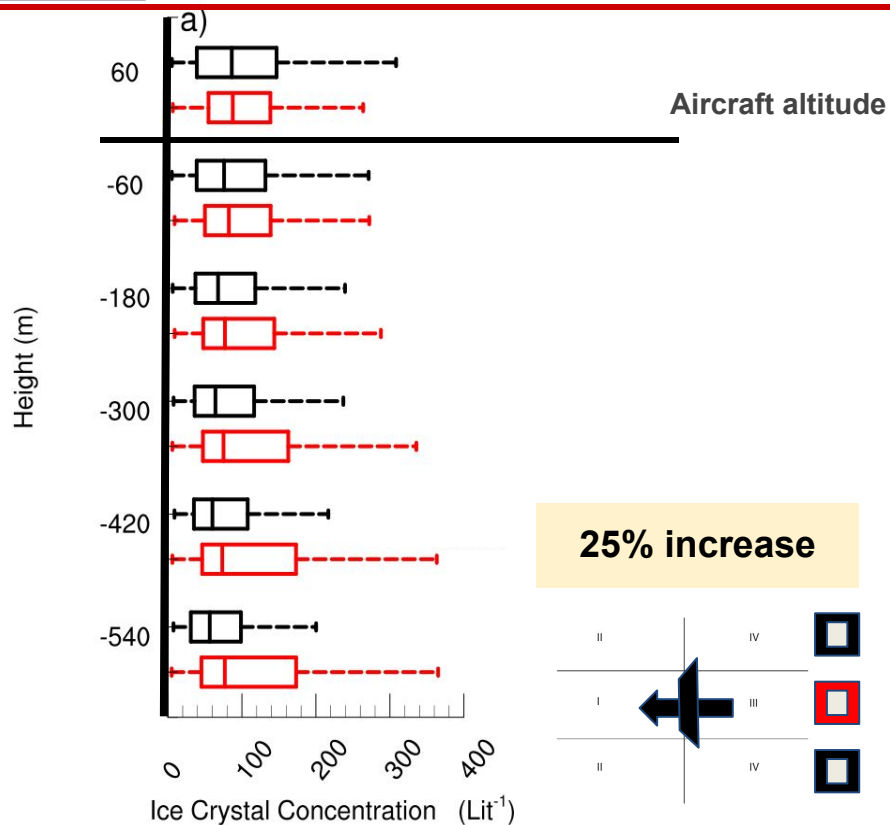
- Vertical resolution 60 m
- Horizontal resolution 1 km
- size > 5 μm
- Geometrical thickness < 2 km
- 12 cases **ahead** the aircraft
- 14 cases **behind** the aircraft



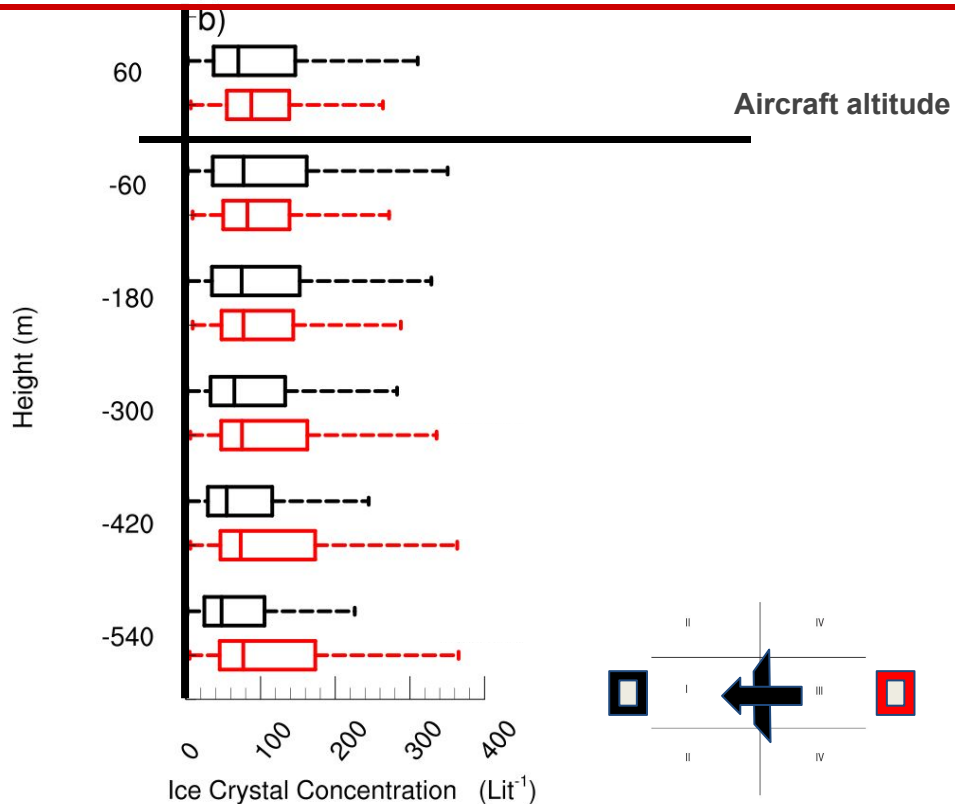
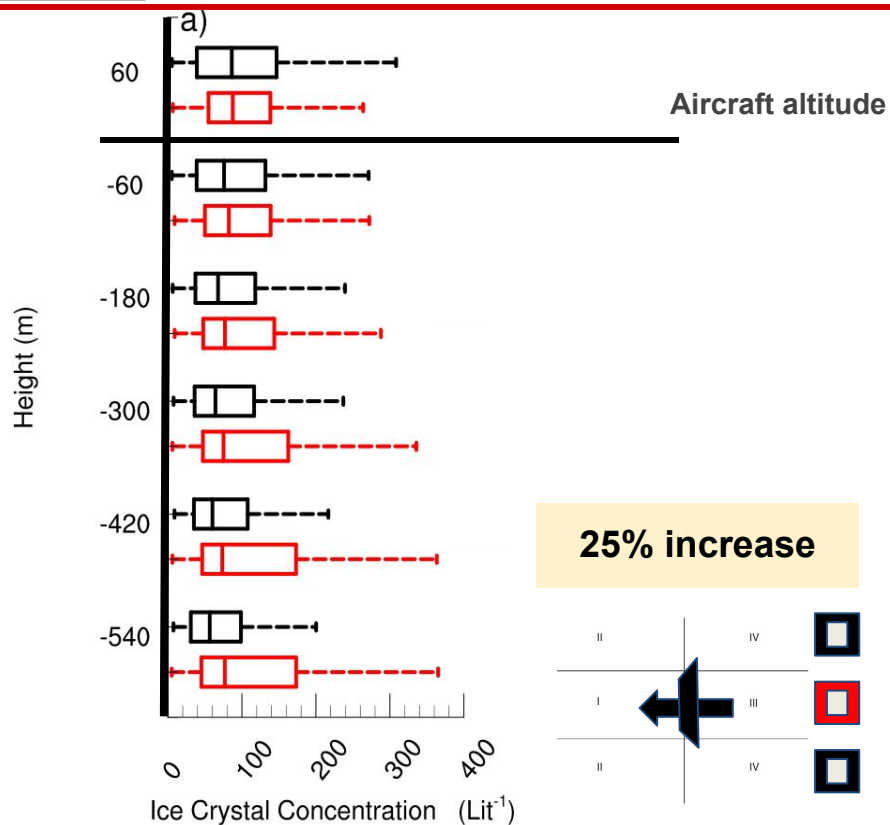
Ice crystal number concentration enhancement due to aircraft



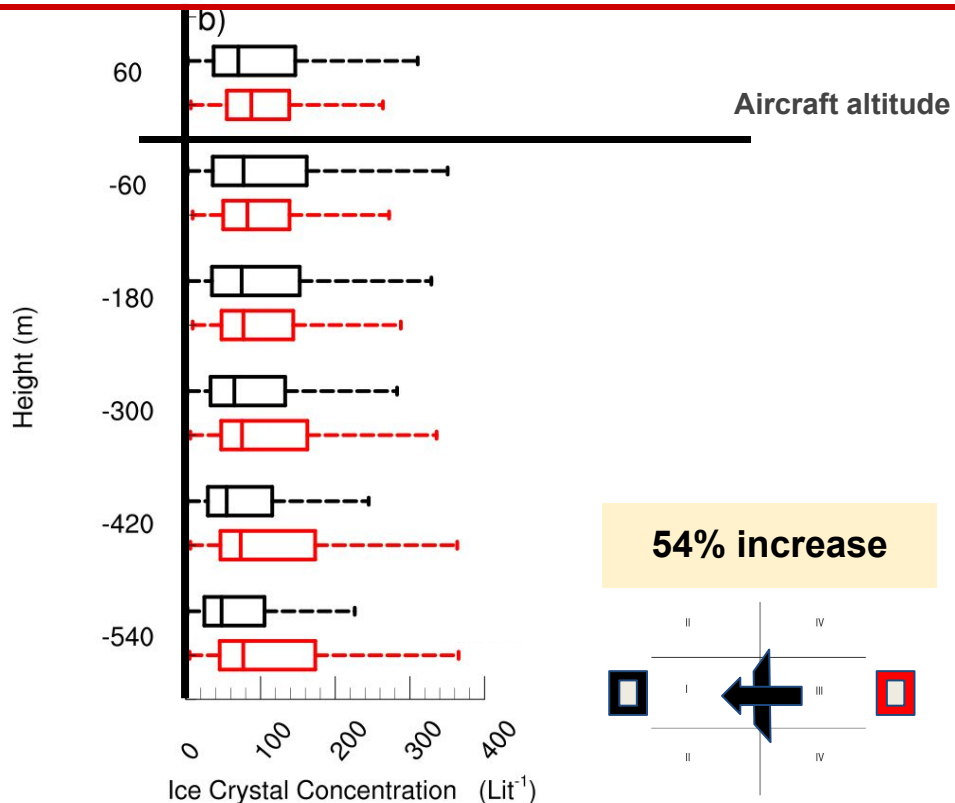
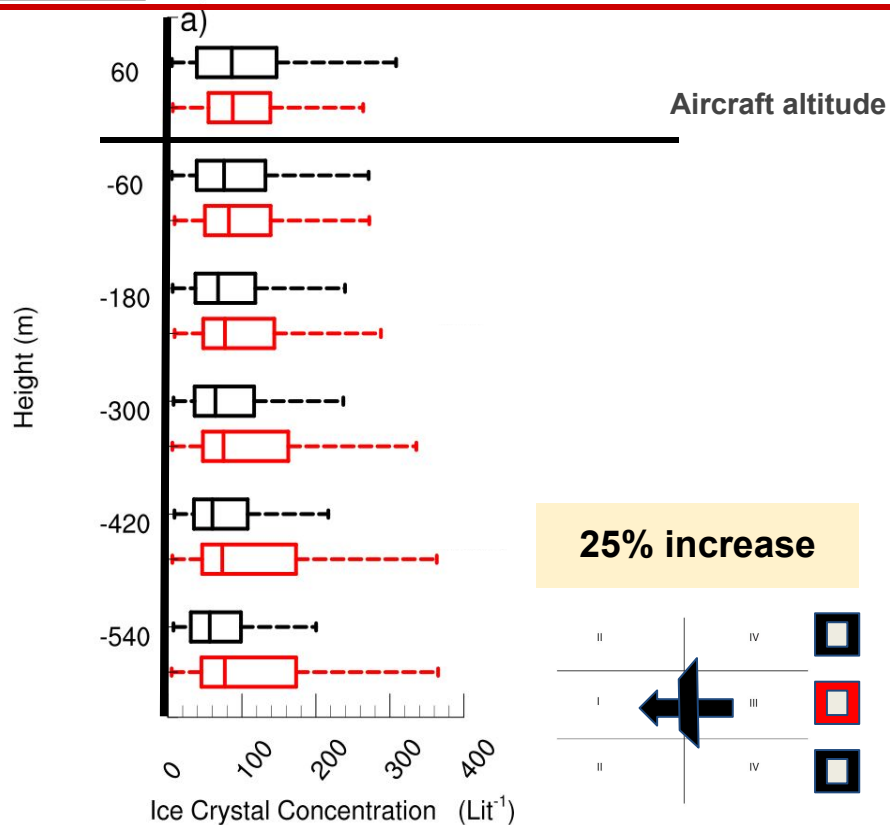
Ice crystal number concentration enhancement due to aircraft

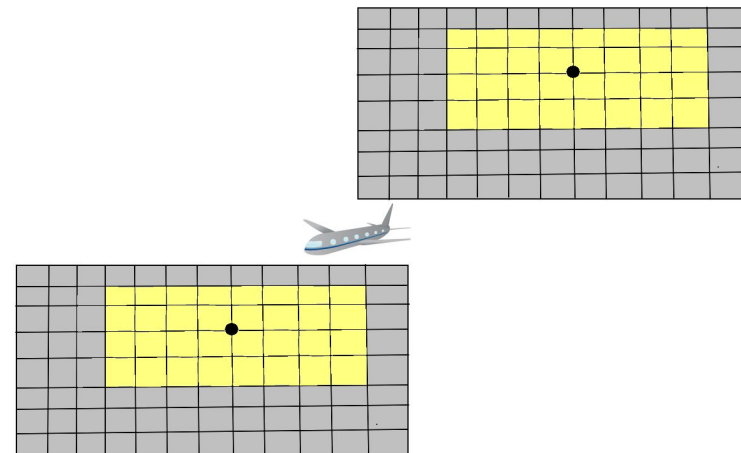
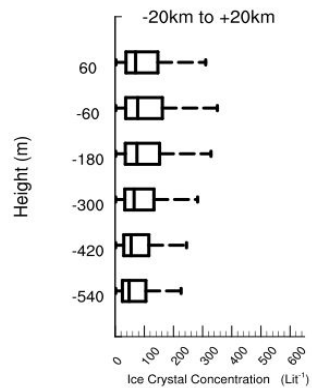
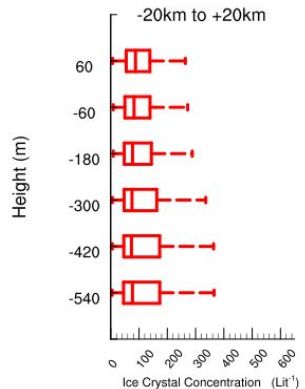


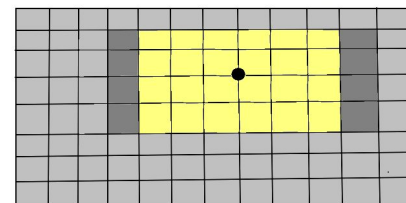
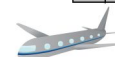
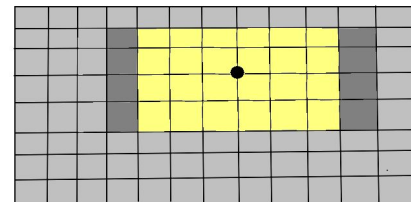
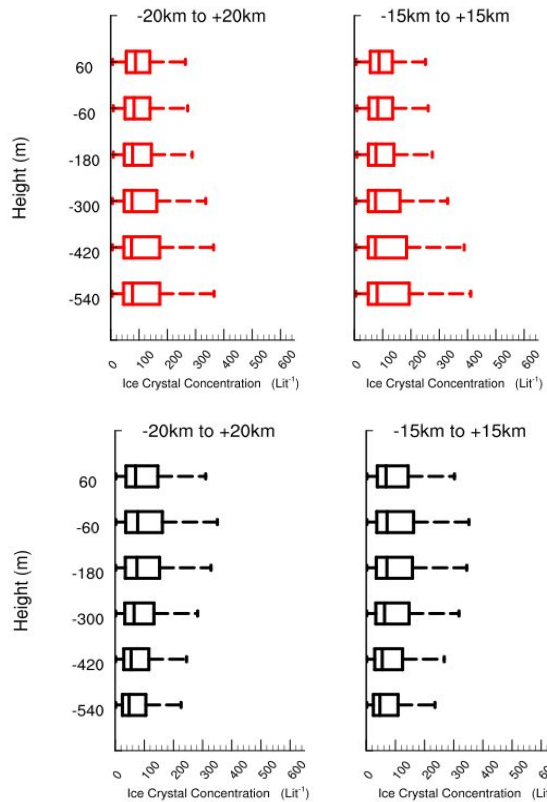
Ice crystal number concentration enhancement due to aircraft

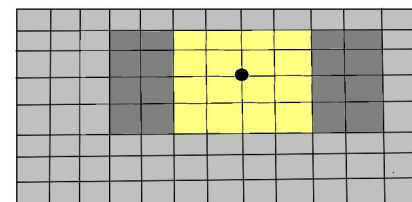
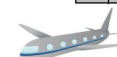
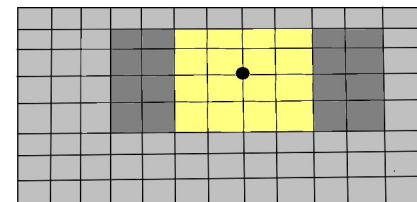
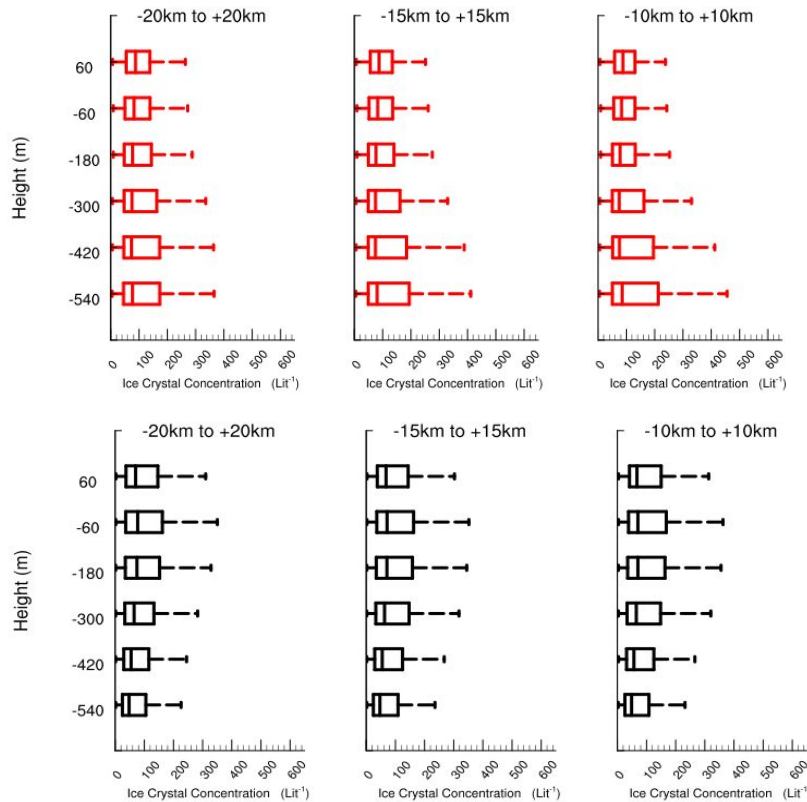


Ice crystal number concentration enhancement due to aircraft

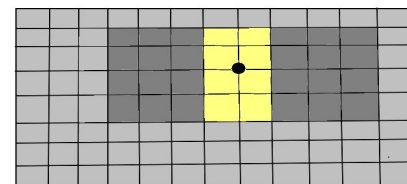
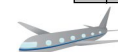
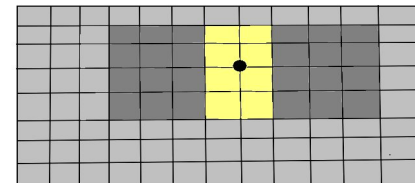




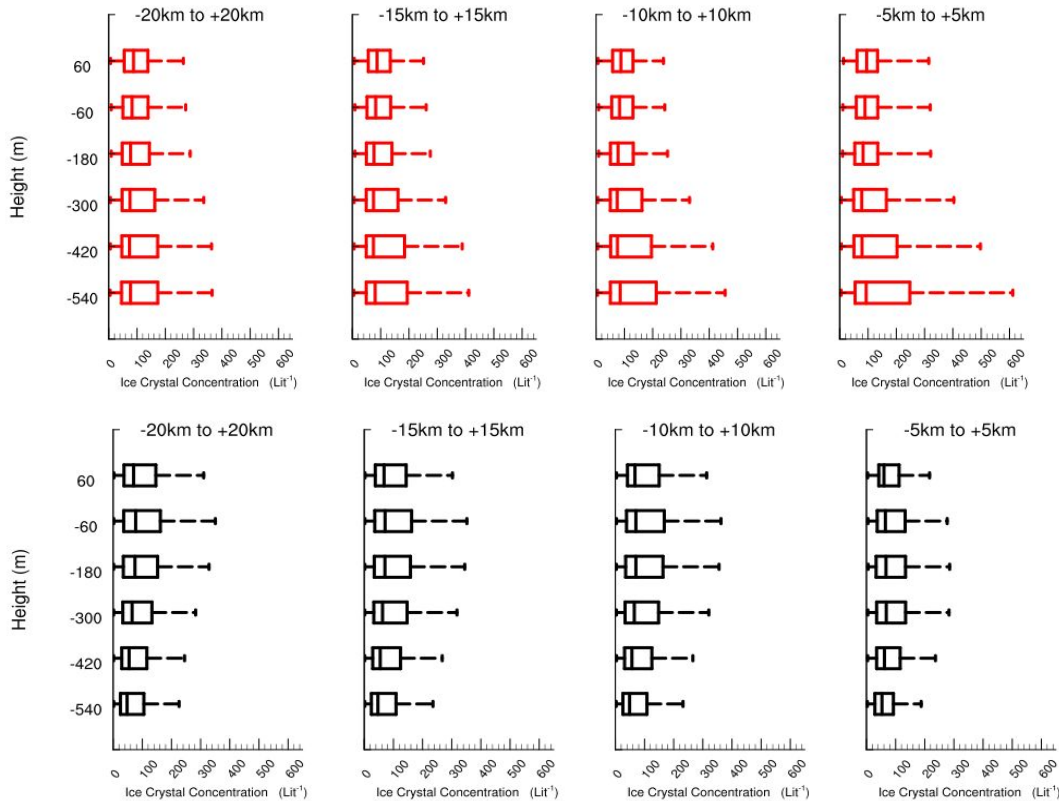
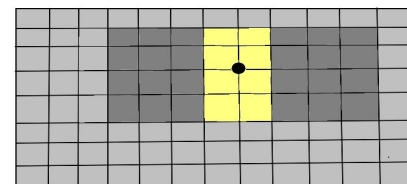
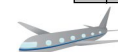
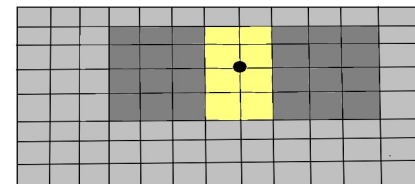




Restricting the affected region



- 74% increase in ICNC



- **Even without an increase in cloudiness, contrails are capable to modify the properties of already existing clouds**
- **Aviation pollution increase ICNC a few hundred meters below the flight corridor**

Thank you for your attention!
