

OSCAR final workshop

Giant aerosol effects on precipitation

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Pilar Gumà-Claramunt, Aldo Amodeo and Fabio Madonna

Consiglio Nazionale delle Ricerche – Istituto di Metodologie per l'Analisi Ambientale
(CNR-IMAA), Tito Scalo, Potenza, Italy

pilar.guma@imaa.cnr.it



Introduction (I)



Aerosols affect the meteorological and climate system in many ways:



Giant and ultra-giant aerosols ($r > 5\mu\text{m}$), specially, determine the concentration of the initial cloud droplets, the clouds albedo and lifetime, and the precipitation formation.



Their distribution and importance is not well known.

Introduction (II)

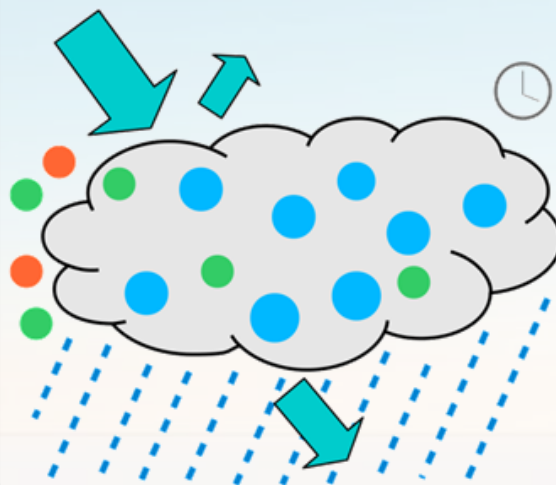


Direct effect

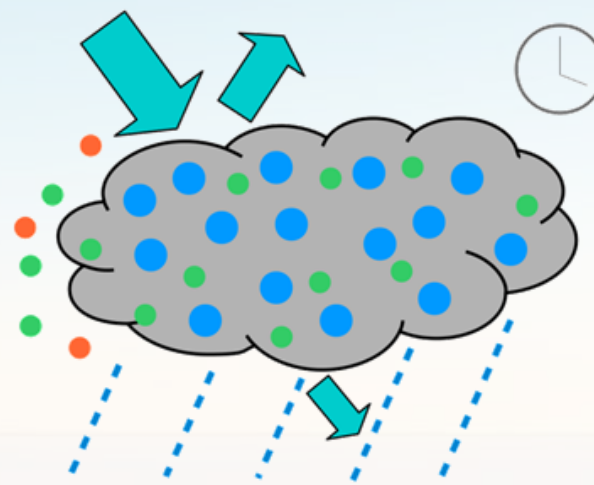


Indirect effect

Clean cloud



Polluted cloud



● Cloud droplets ● Aerosol (CCN) ● Aerosol (no CCN) // Rain

Aim



Enhance the size range in which **aerosol microphysical properties** can be retrieved taking advantage of the **synergy** of lidar and radar observations



Lidar and sun photometer are used to retrieve aerosol microphysical properties in absence of thick clouds



Cloud radar can detect giant and ultragiant aerosols

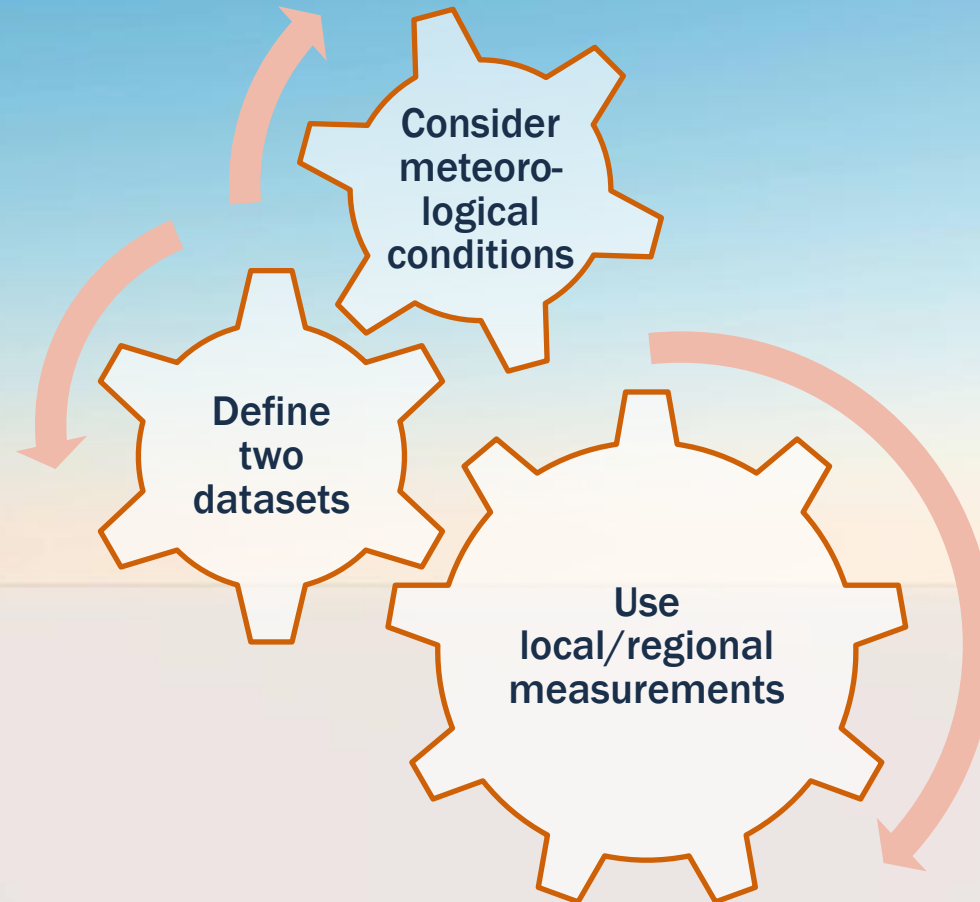


Study aerosol effects at a regional scale

Methodology



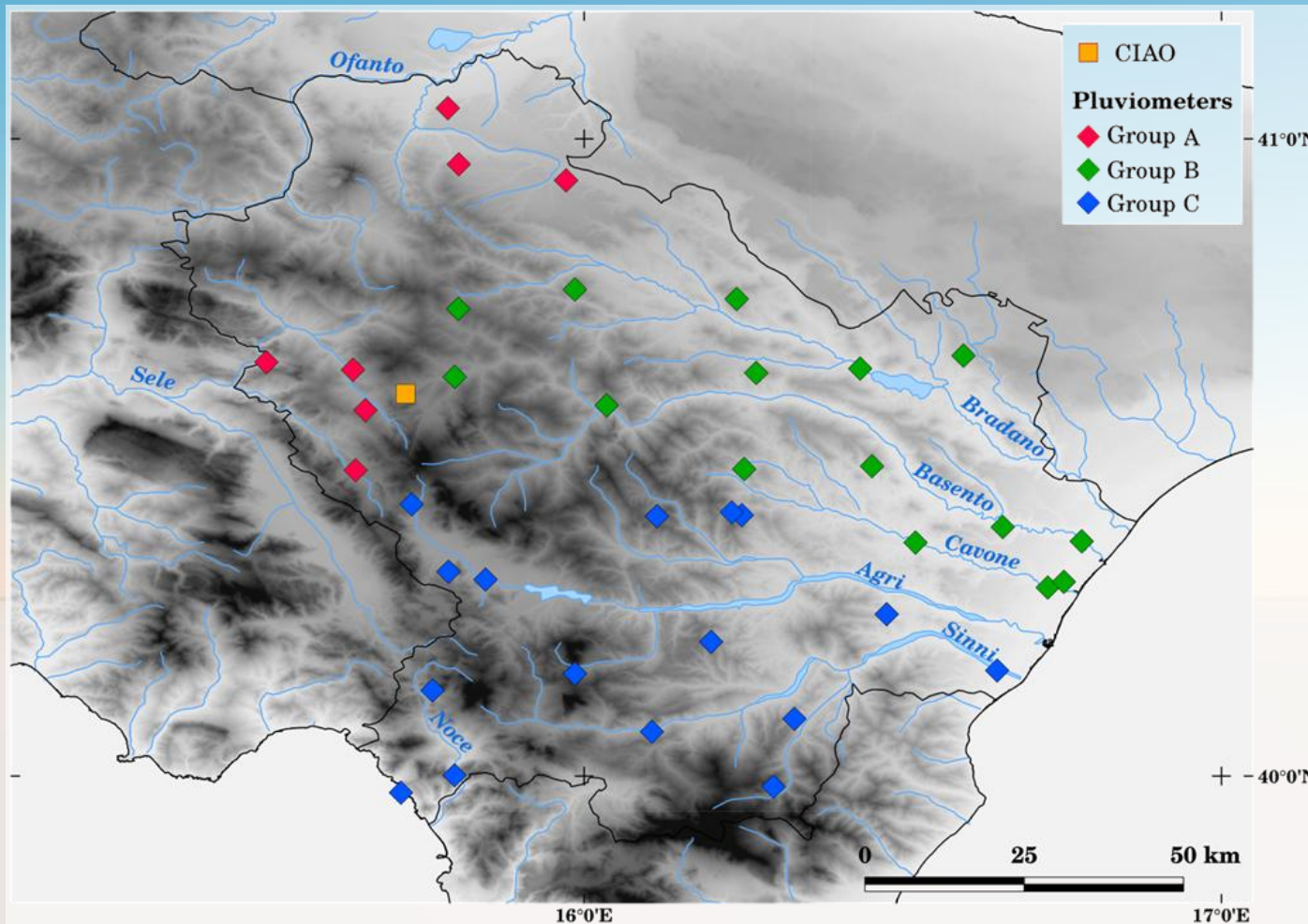
To study the giant aerosols effects at a regional scale, it is necessary to:



Methodology (I)



Basilicata Civil Protection rain gauges network:



Time resolution:
1 hour

Accuracy:
0.2 mm

Methodology (II)



Two datasets are needed:

Giant

Cloud radar giant
aerosols observations

± 4h from 13:00 to
14:00 LT

Control (not giant)

Cloud radar not giant
aerosols observations

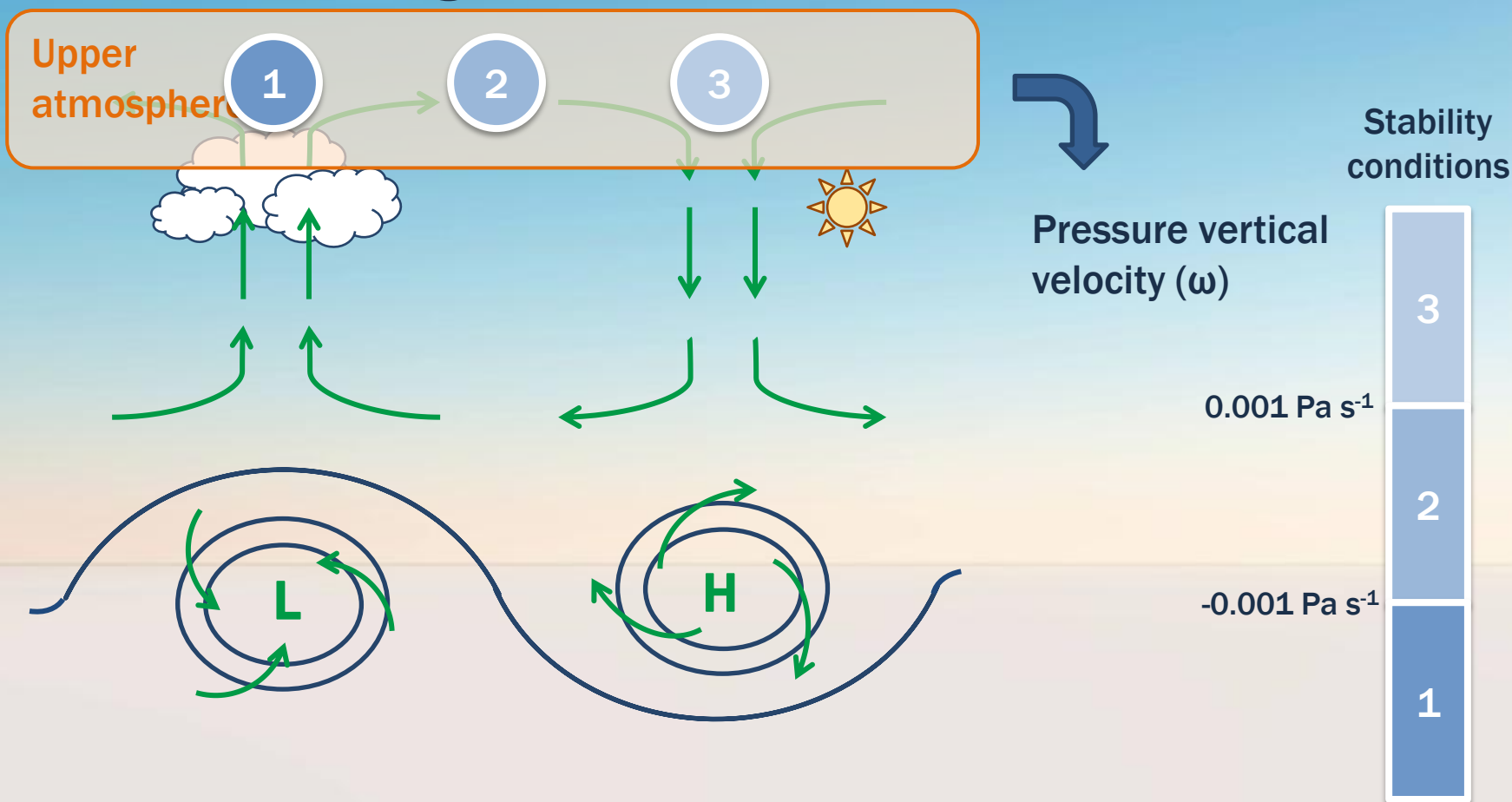
Effective radius < 2.5
µm

From 13:00 to
14:00 LT

Methodology (III)



The meteorological situation is accounted for:



Dataset



- Number of cases (March 2009 – June 2015):

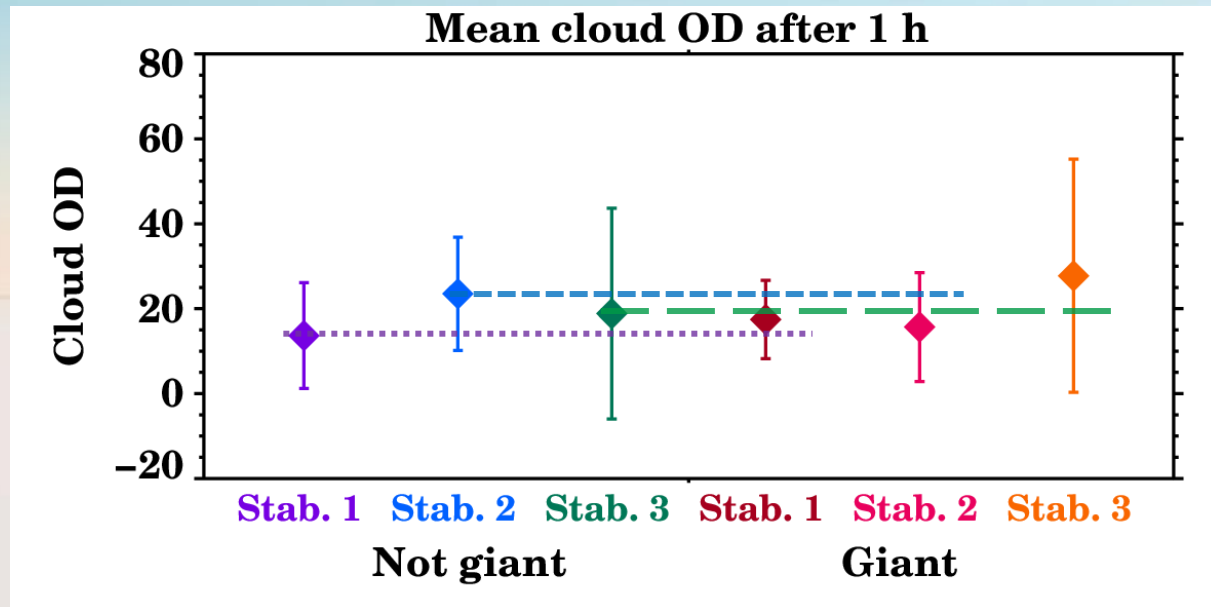
Stability condition	Giant	Not giant
1	33	47
2	88	70
3	29	42
All	150	159

- The atmosphere is evolving continuously



different time periods are considered after each event

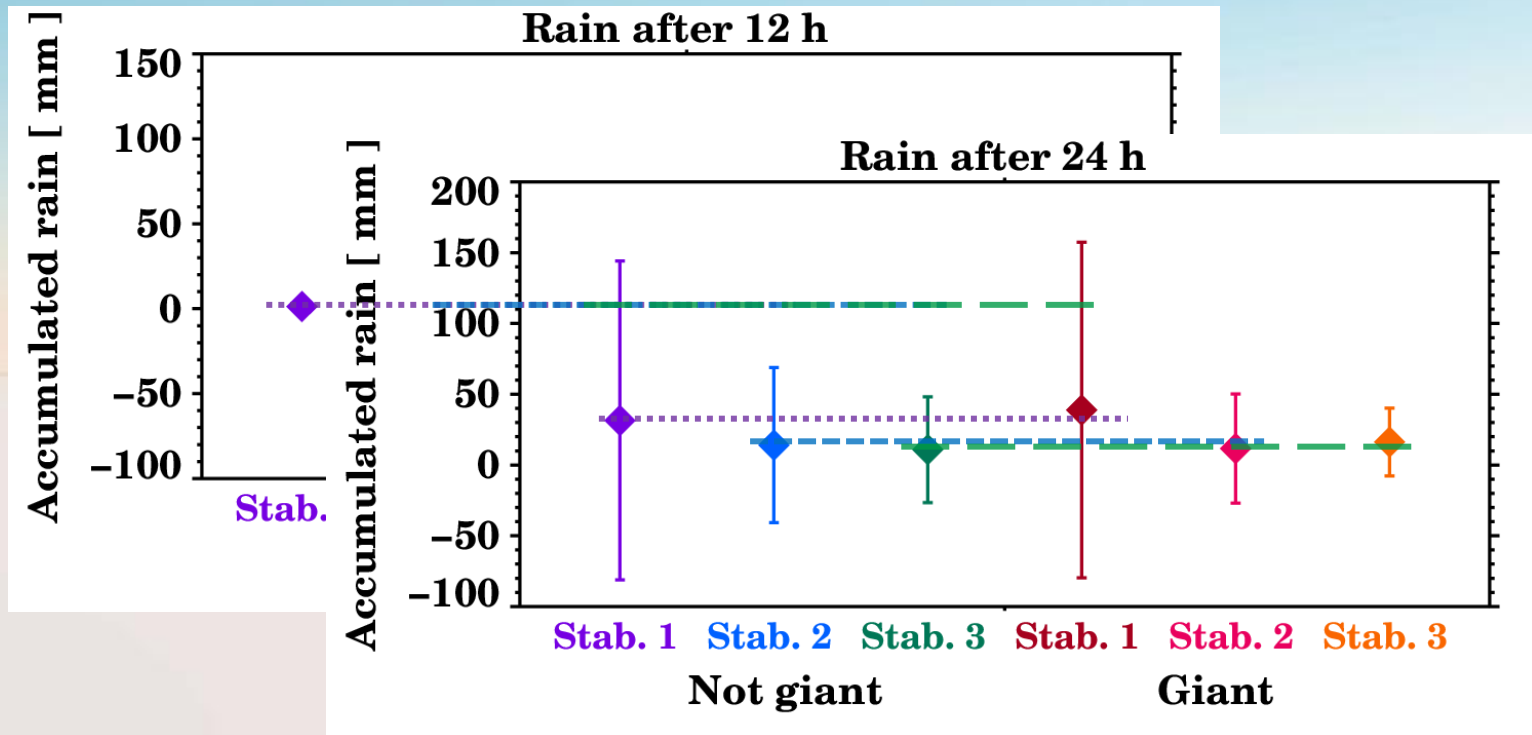
Cloud Optical Depth (COD)



Accumulated precipitation



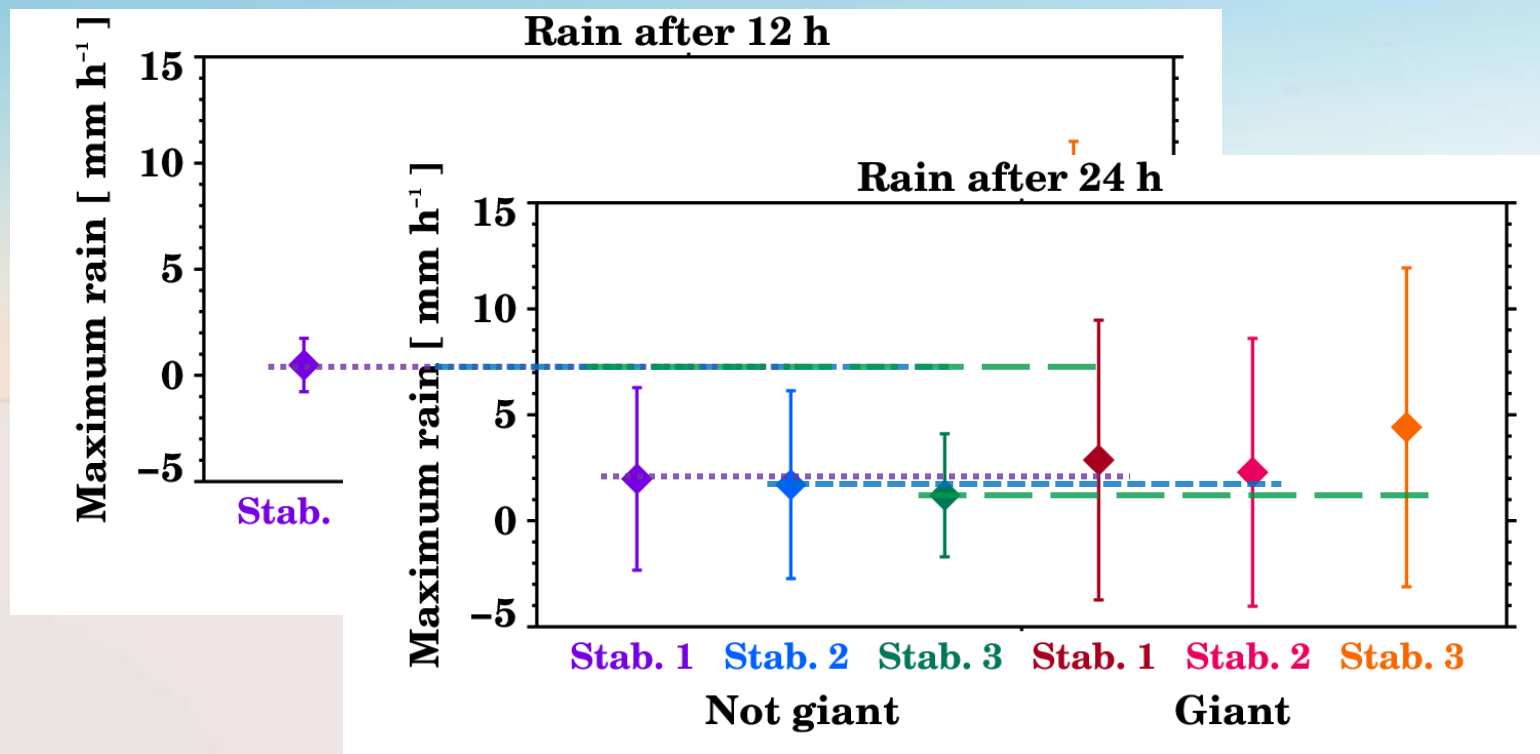
- Total rain during a certain amount of time



Maximum rain rate



- Rain intensity (quantity/time)



Conclusions



Giant aerosols affect the regional meteorology

- Invigorate the cloud development
- Enhance the accumulated (total) precipitation
- Increase the maximum rain rate

The study of aerosols is useful for nowcasting (weather forecast for some hours), i.e. of flash floods

Acknowledgements



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