Observing mountain precipitation variability from the space

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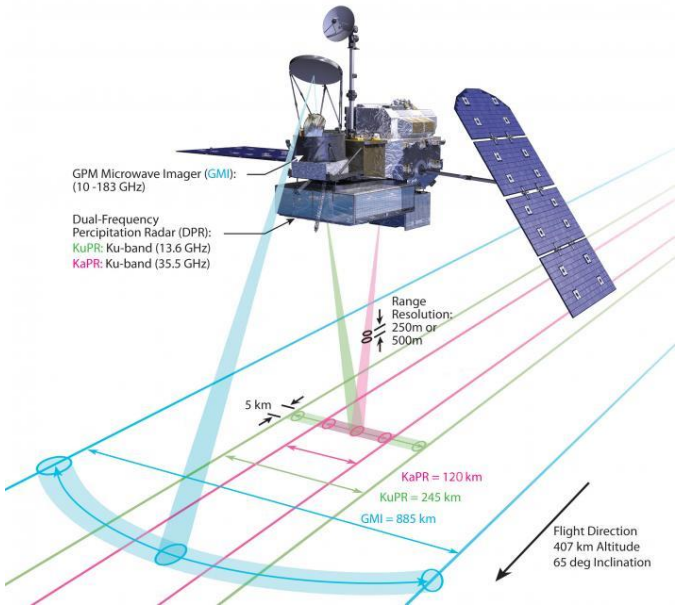
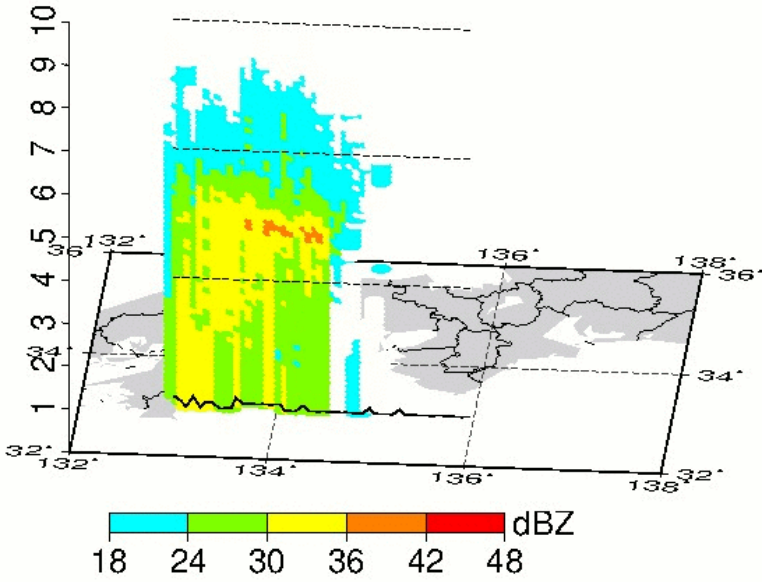




GPM-DPR observe 3-D structure of precipitation system

JAXA Global Rainfall Watch (GSMaP) 2019.08.22 14:00(JST)
https://sharaku.eorc.jaxa.jp/GSMaP/index_j.htm

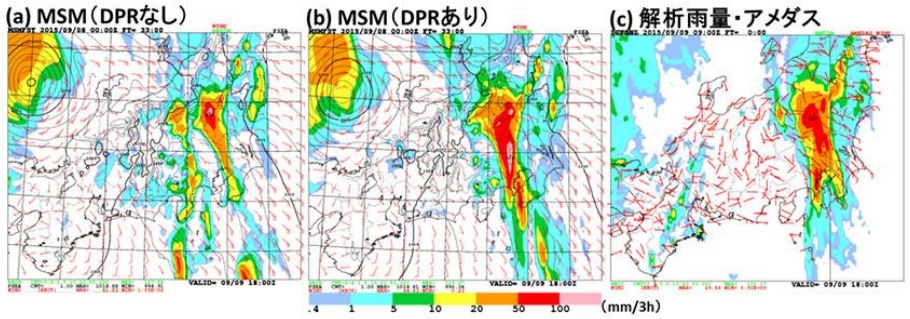
PMV constellation

GSMaP data

Near real time, hourly, 0.1 deg., global precipitation are produced.

Breakthroughs by Global Precipitation Measurement (GPM) mission

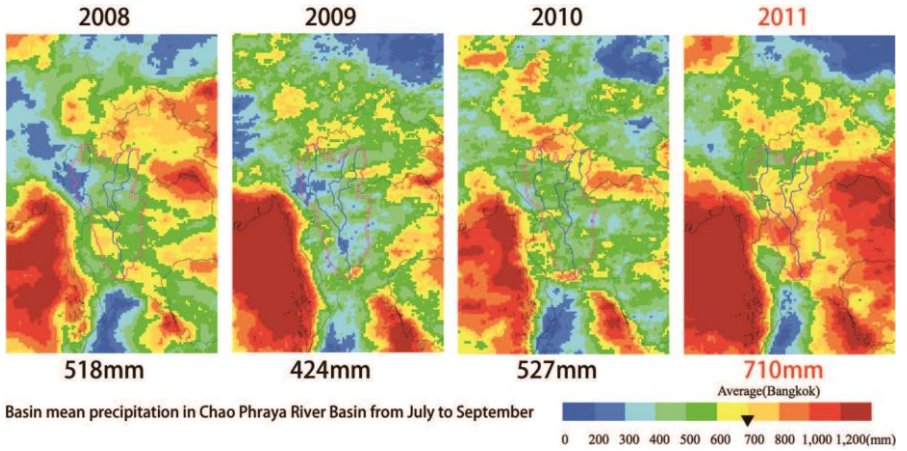
Weather forecast



Without DPR | With DPR | Observation

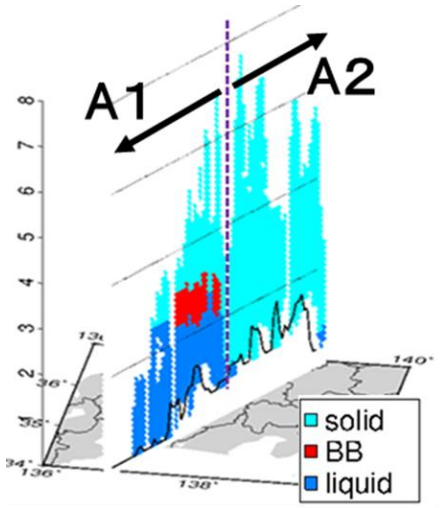
<- Understanding of global water cycle and weather/climate system, especially over ocean and remote areas such as mountains.

Flood situation in Thailand



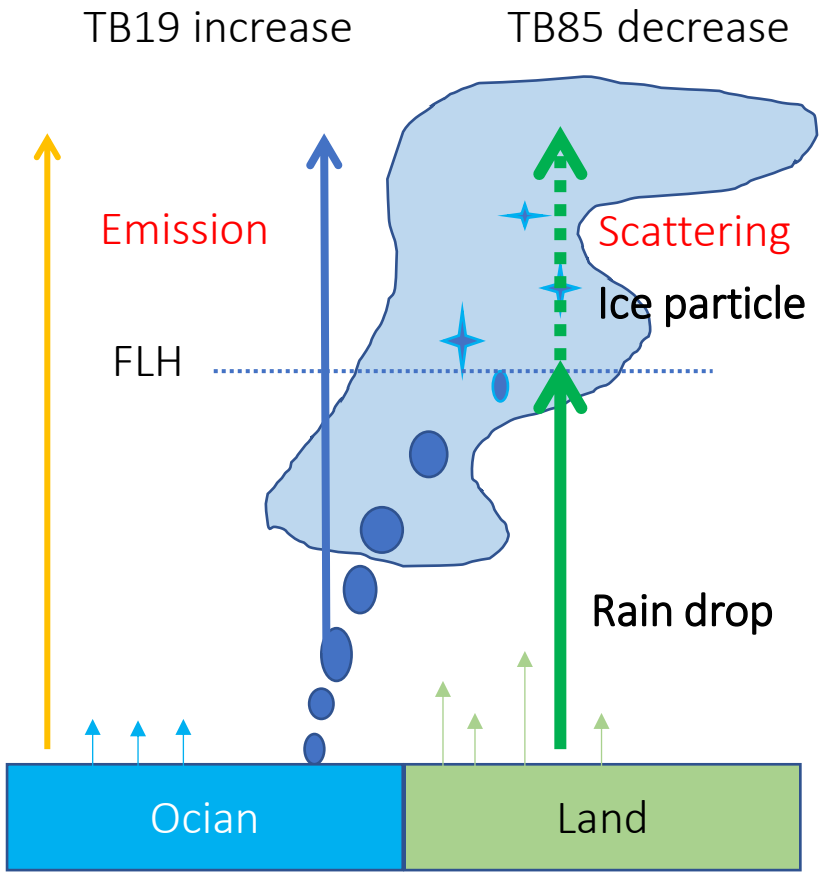
-> Utilize for weather forecast and the flood warnings as nowcast or data assimilation

Rain/snow discrimination by DPR



<- Expectation of high latitudes precipitation including snow by GPM Dual-frequency Precipitation Radar (DPR), as the following mission of TRMM.

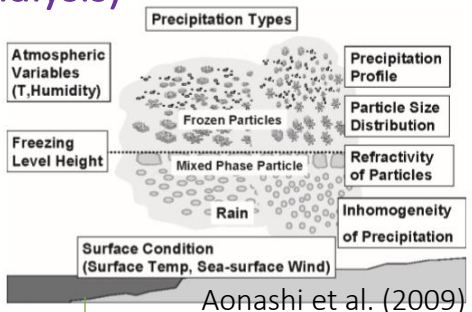
Algorithms to produce GSMaP-MVK data



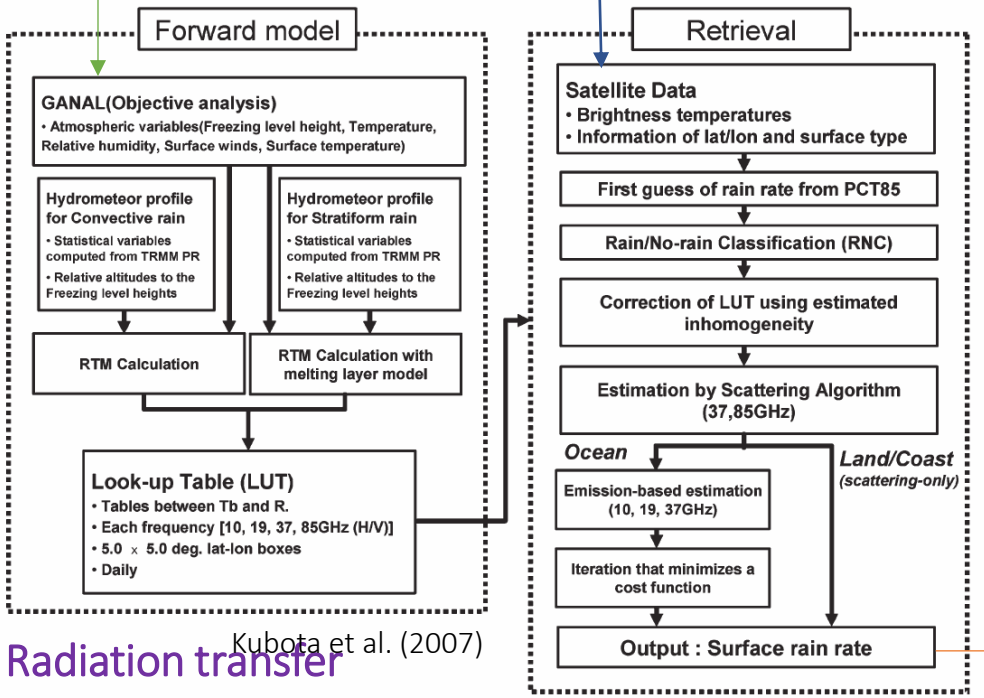
Observation by PMV constellation

3 hours ~

Environment data (objective analysis)



Aonashi et al. (2009)

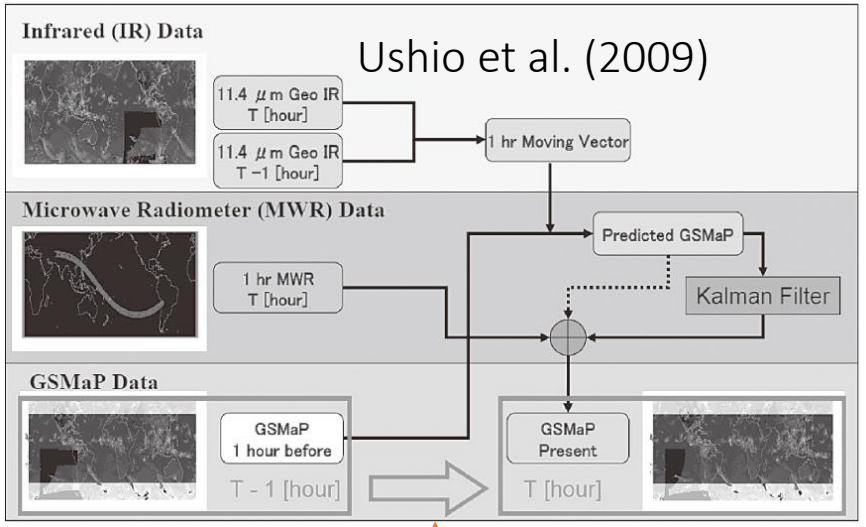


Kubota et al. (2007)

Radiation transfer model to produce look-up table

Precipitation retrieval with observation data

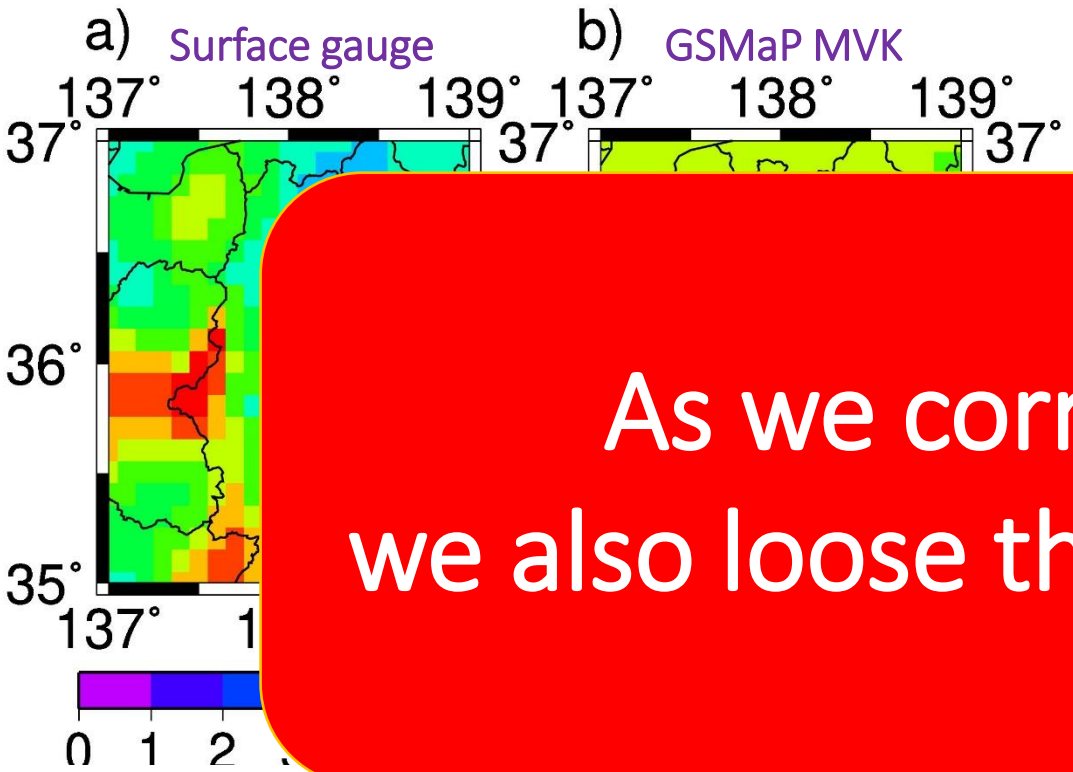
Ushio et al. (2009)



IR Moving Vector with Kalman filter (MVK) to produce hourly data

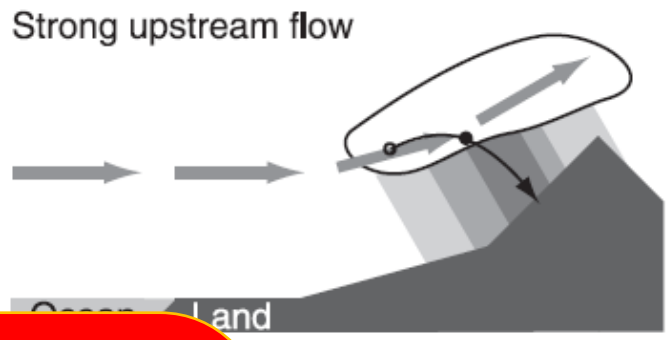
Near real time, hourly, 0.1 deg., global products

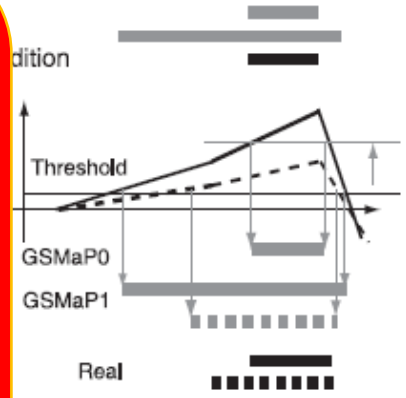
Biases in the GSMaP-MVK data

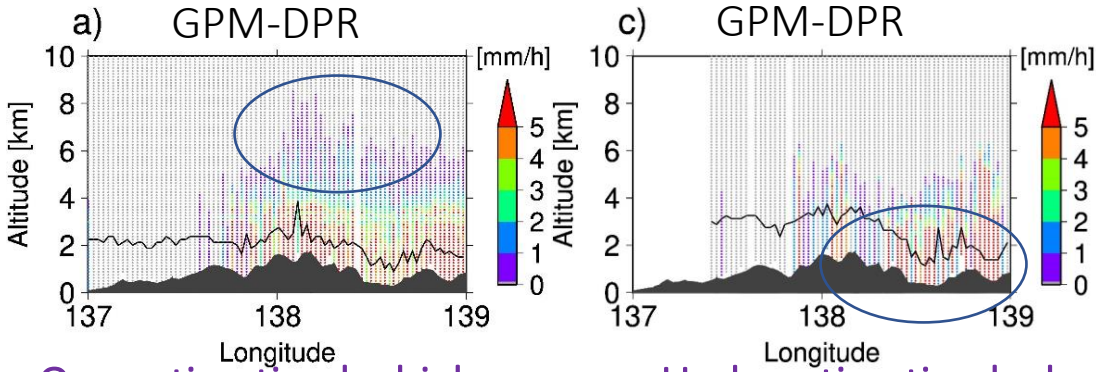


As we correct the data,
we also loose the signal of nature!

1) Corrections for orographic ascending using objective data
(Yamamoto et al., 2017)



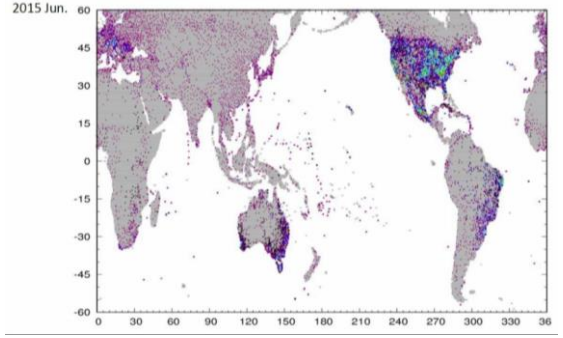




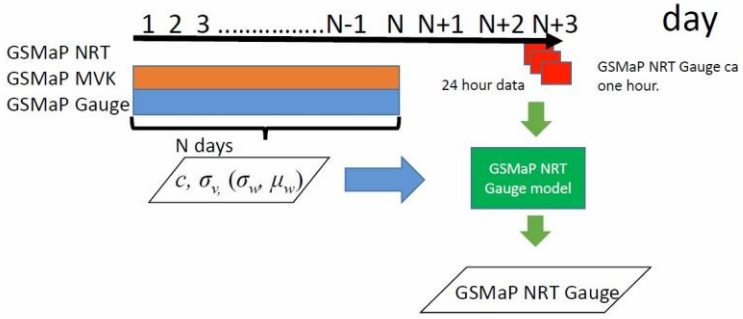
Overestimation by high-level scattering

Underestimation by low-level warm rain

(Yamamoto et al., 2017)

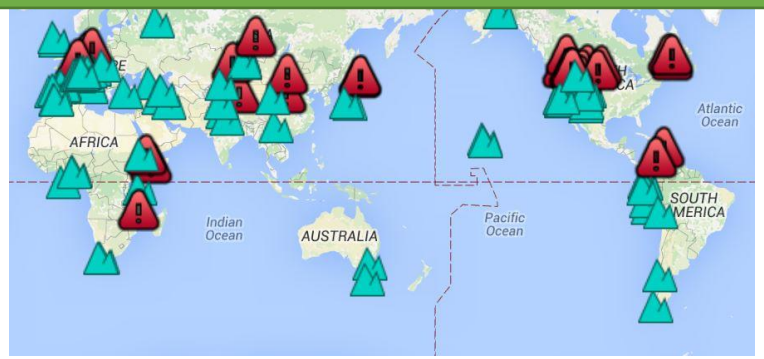


Flow of GSMaP NRT Gauge

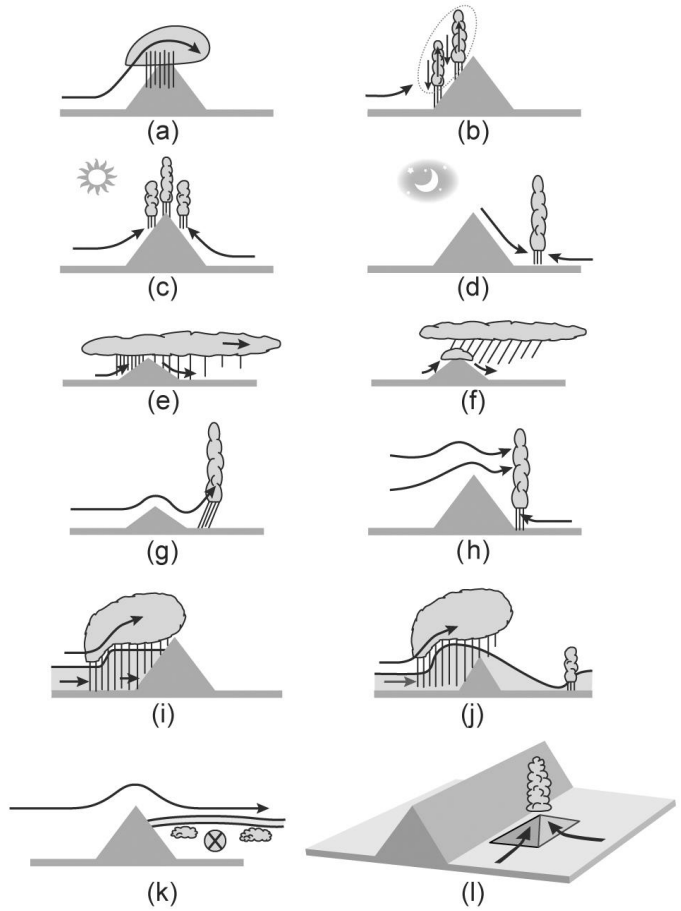


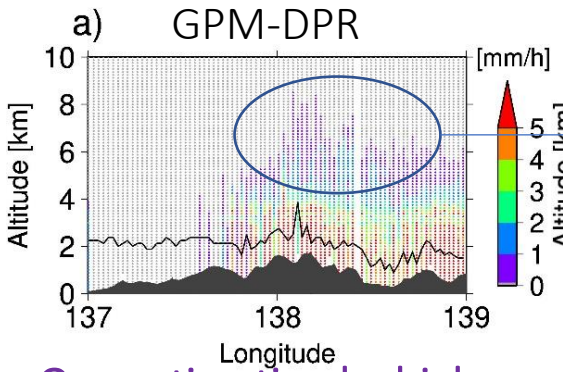
GSMaP-Gauge data

Validation study in mountains are anticipated.

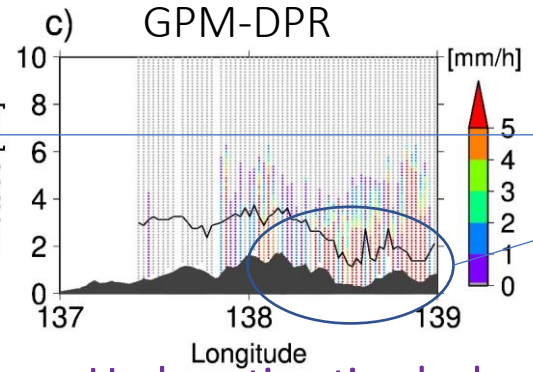


Various effects of orography to precipitation system (Houze, 2012)





Overestimation by high-level scattering



Underestimation by low-level warm rain

We need to understand the mechanism of precipitation over mountains and improve algorisms.

- Question 1: Will artificial intelligence and robotics boost or limit Natural Hazard Research in mountain areas?

Yes > AI is going to be used to improve algorisms, such as the looking-up table of cloud structure may be automatically prepared by radar profile.

- Question 2: What 3D and 4D remote sensing data is available or missing for Natural Hazard Research in mountain areas?

Yes > GPM products already prepare 3D and 4D data and are distributed.