NAGOYA UNIVERSITY

ISEE Institute for Space-Earth Environmental Research

Exploiting the AMSR Instruments for Aerosol, Cloud, and Precipitation Sciences in Synergy with Current and Future Satellite Missions

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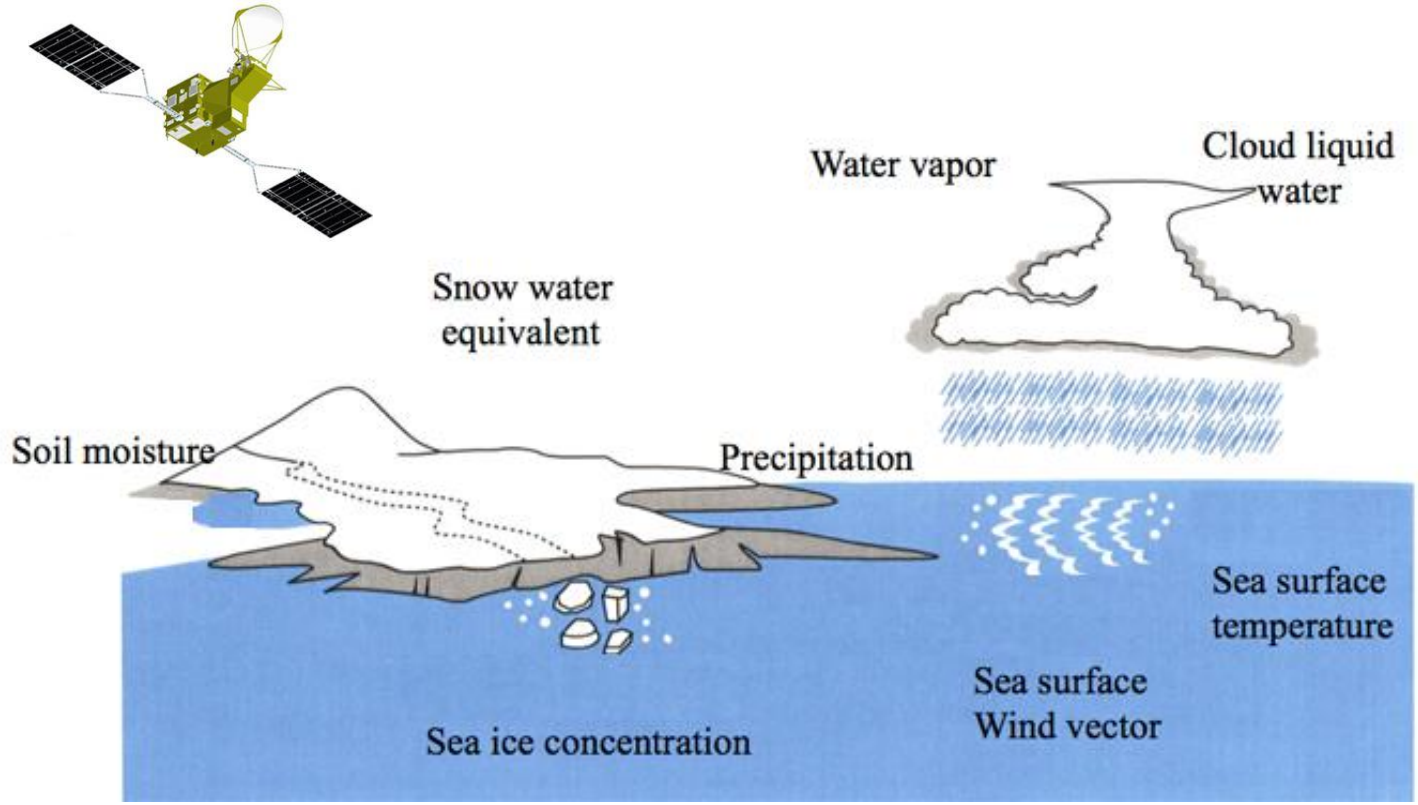
Observational targets of the AMSR instruments



Schematic adopted from https://suzaku.eorc.jaxa.jp/GCOM_W/w_gcomw/w_mission_obj_w.html

AMSR series: past , present, and future

AMSR on ADEOS-II (2002-2003)

AMSR-E on Aqua (2002-2011)

Conically scanning microwave radiometer with 6.9 – 89 GHz H/V channels.

AMSR2 on GCOM-W (2012-present)

Extends the heritage of AMSR/AMSR-E.

AMSR3 on GOSAT-GW (FY2023*-)

Enhanced resolution at 10 GHz & addition of WV sounding channels

* As currently planned

Column WV and Precipitation from AMSR2

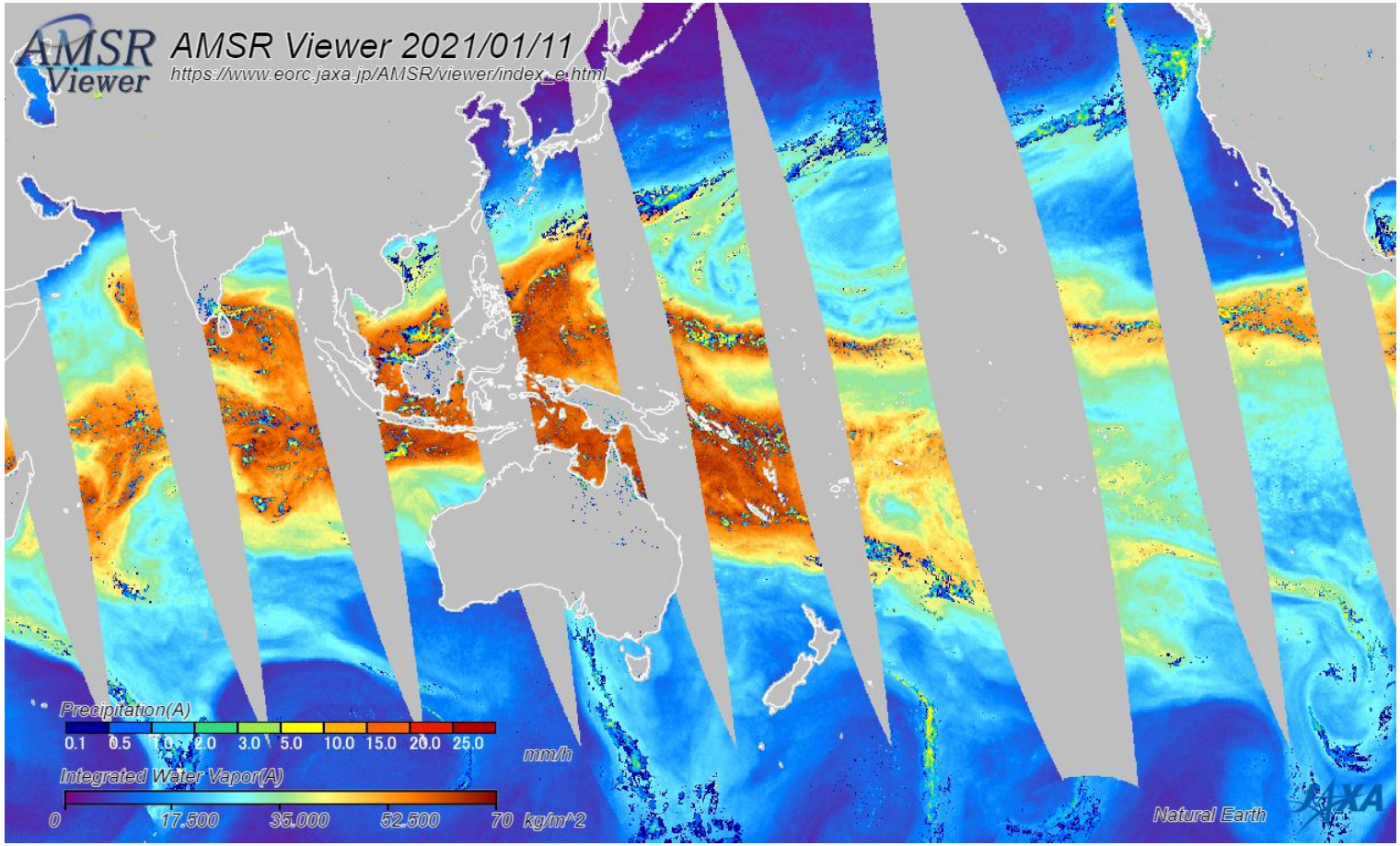


Image created by JAXA AMSR Viewer

Column WV and Precipitation from AMSR2

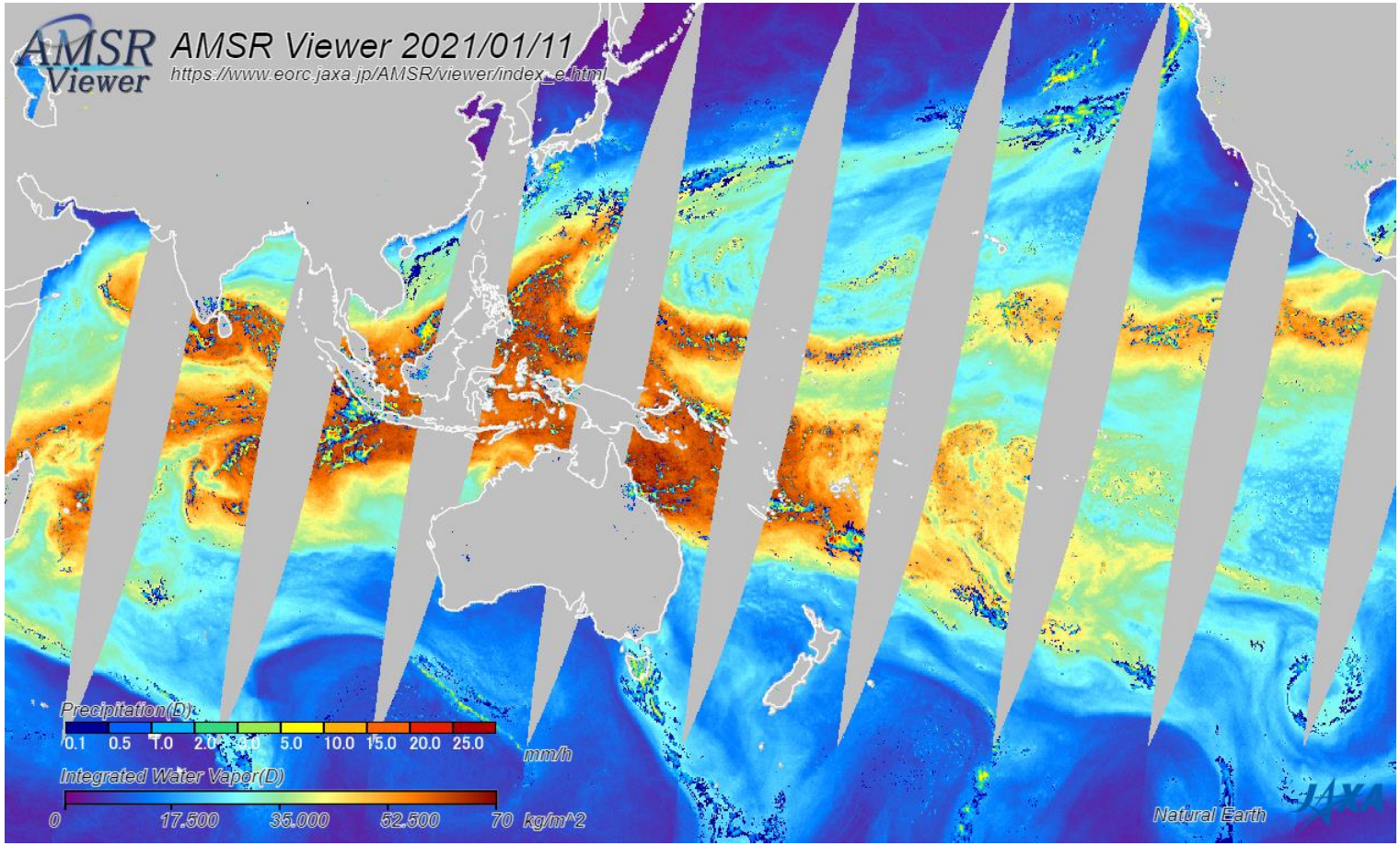


Image created by JAXA AMSR Viewer

Column WV and Precipitation from AMSR2

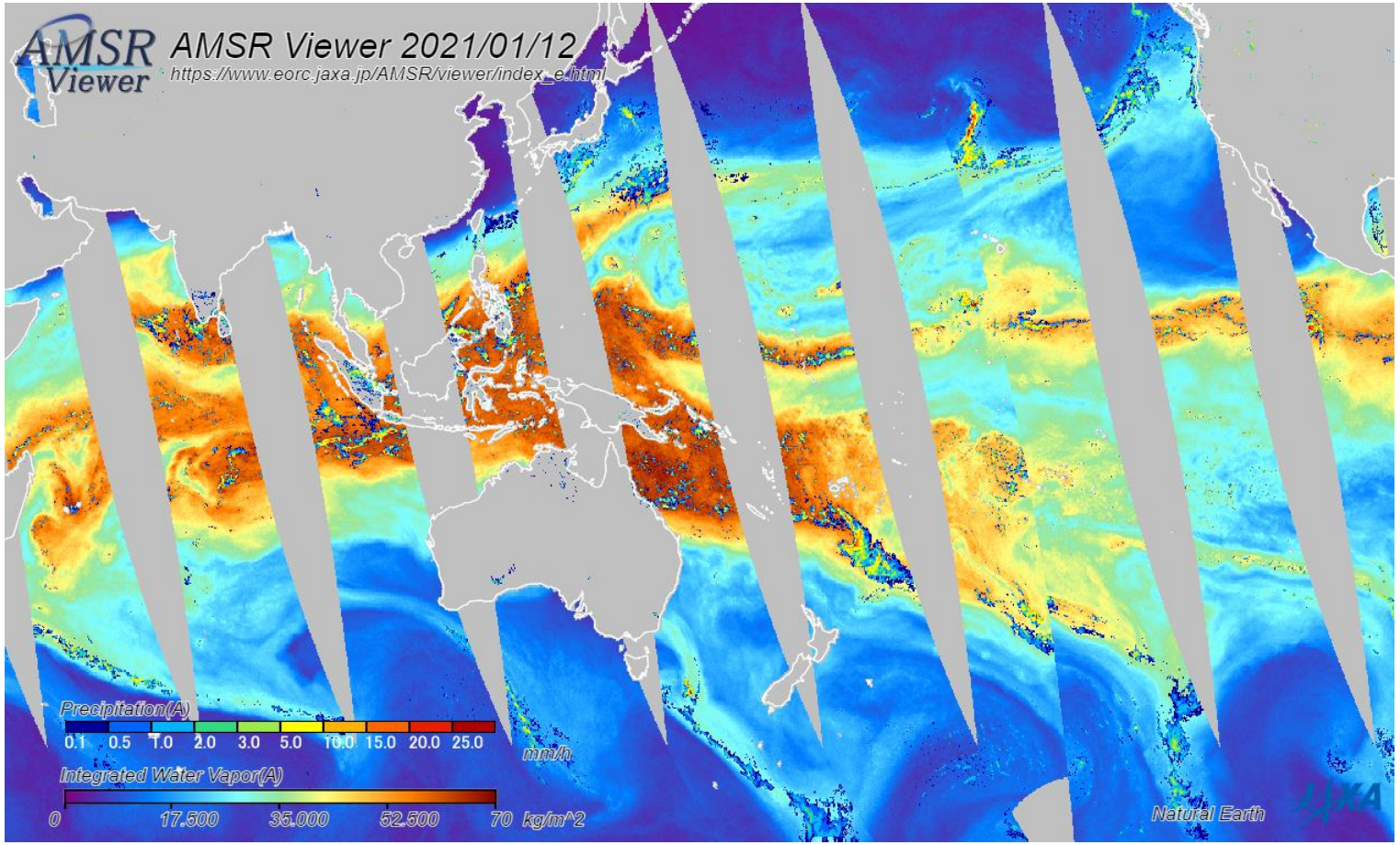
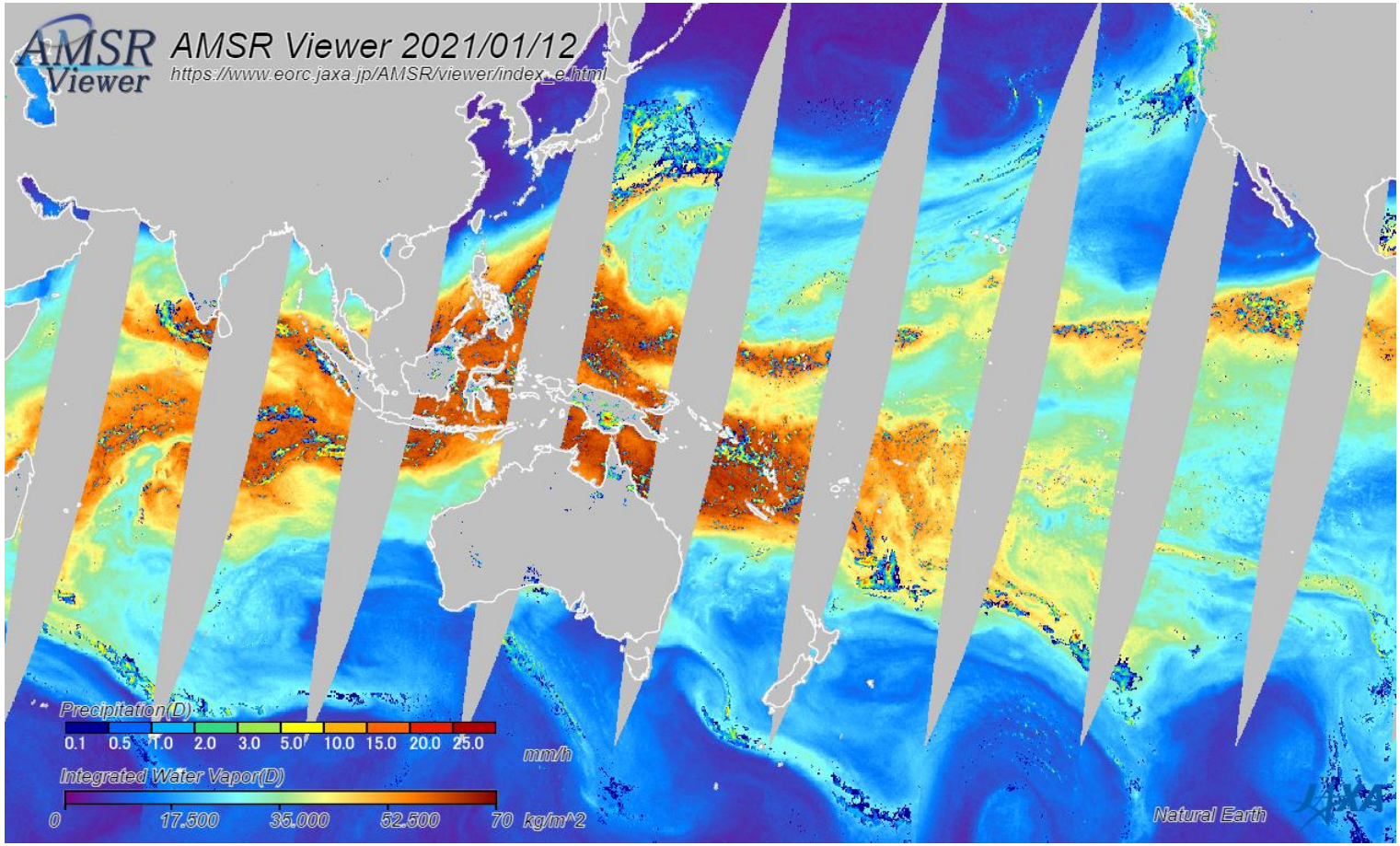


Image created by JAXA AMSR Viewer

Column WV and Precipitation from AMSR2



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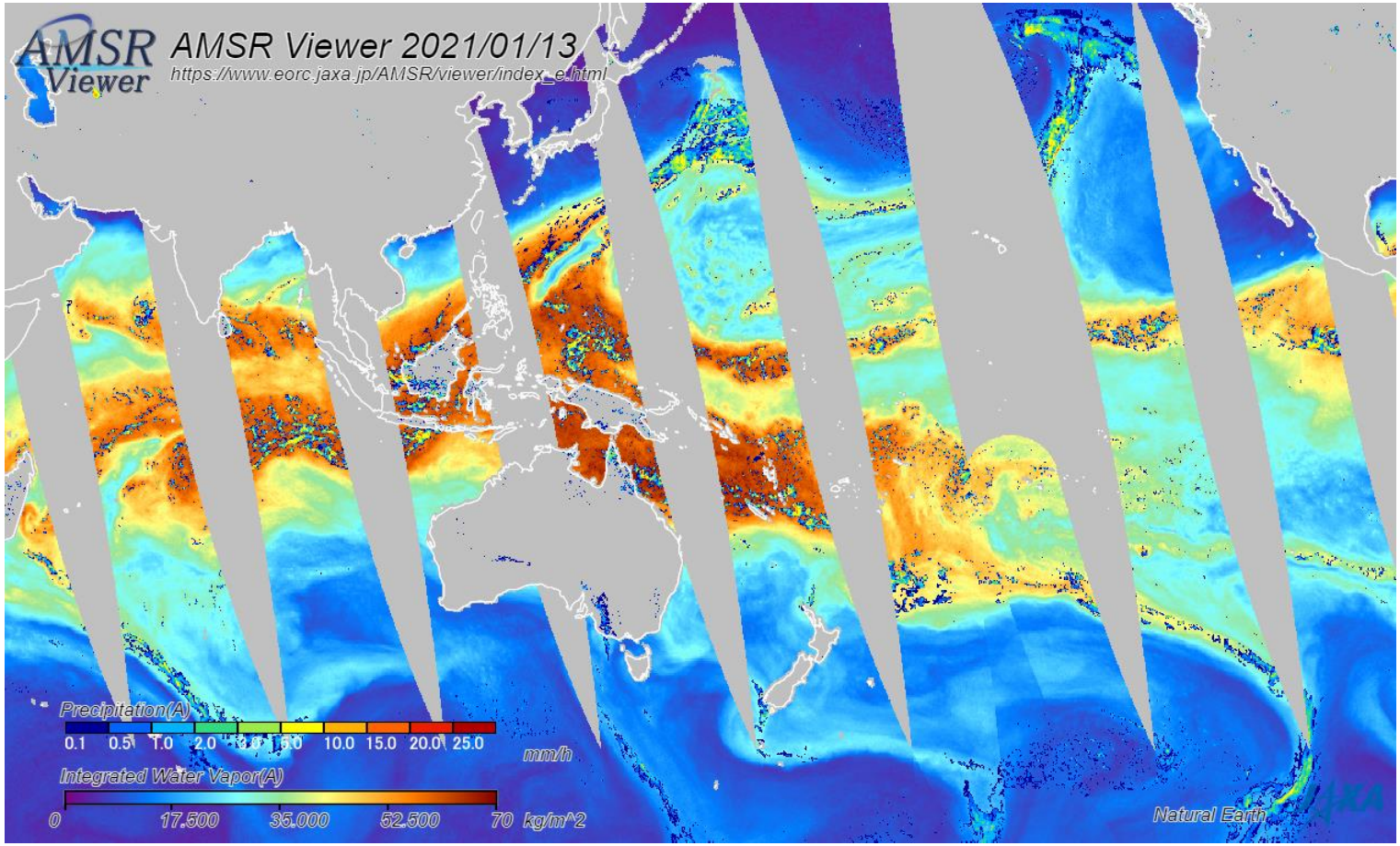
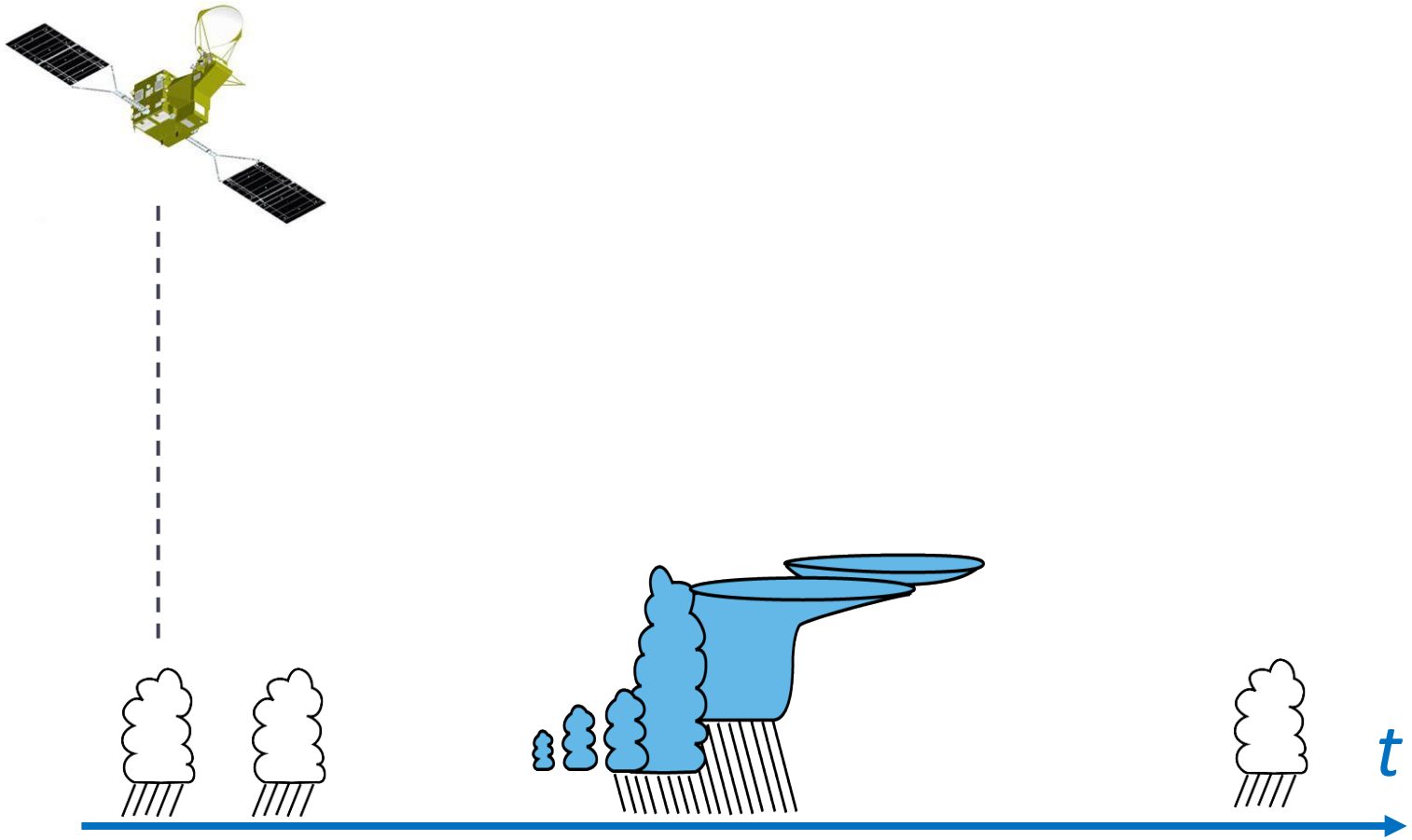
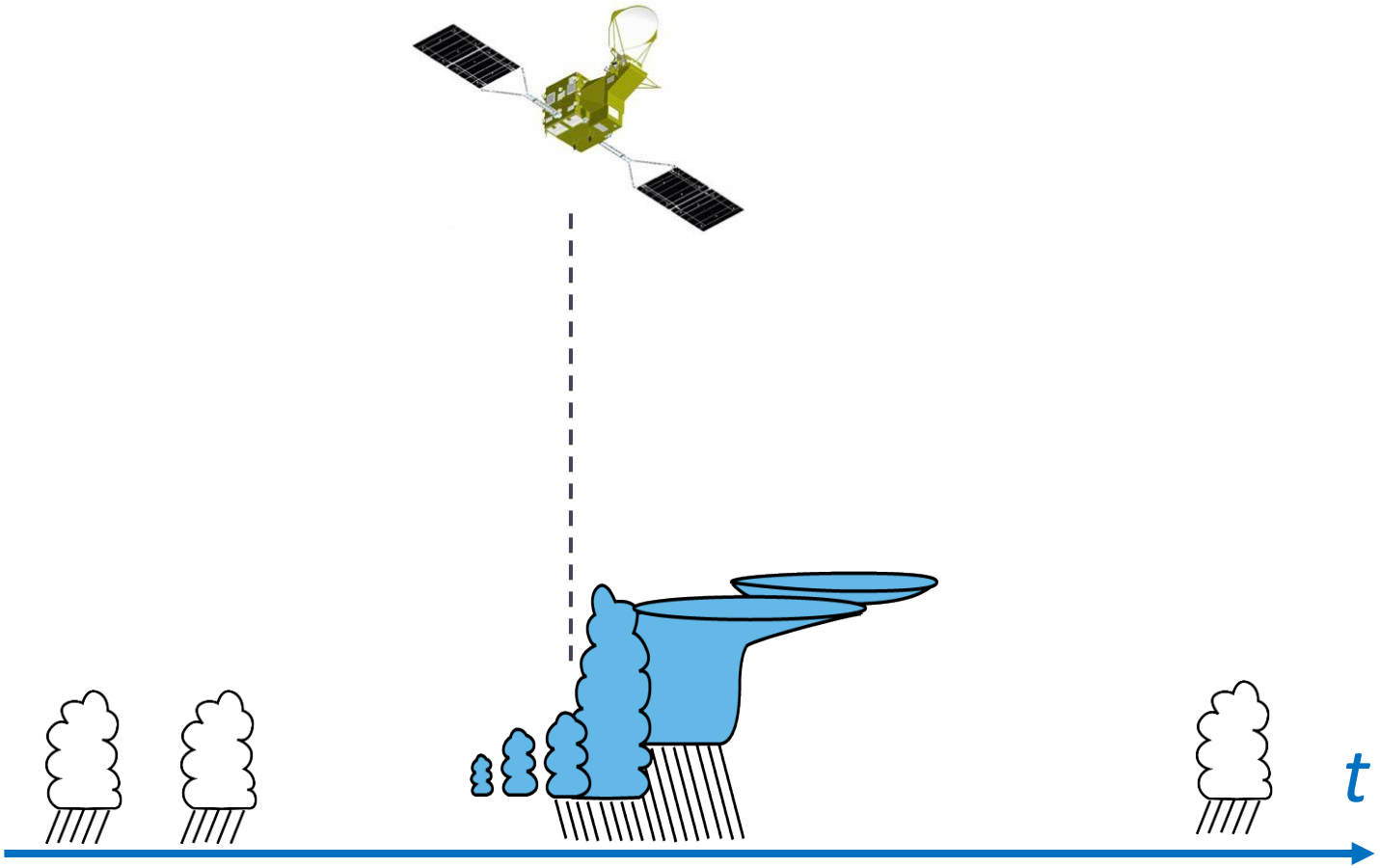


Image created by JAXA AMSR Viewer

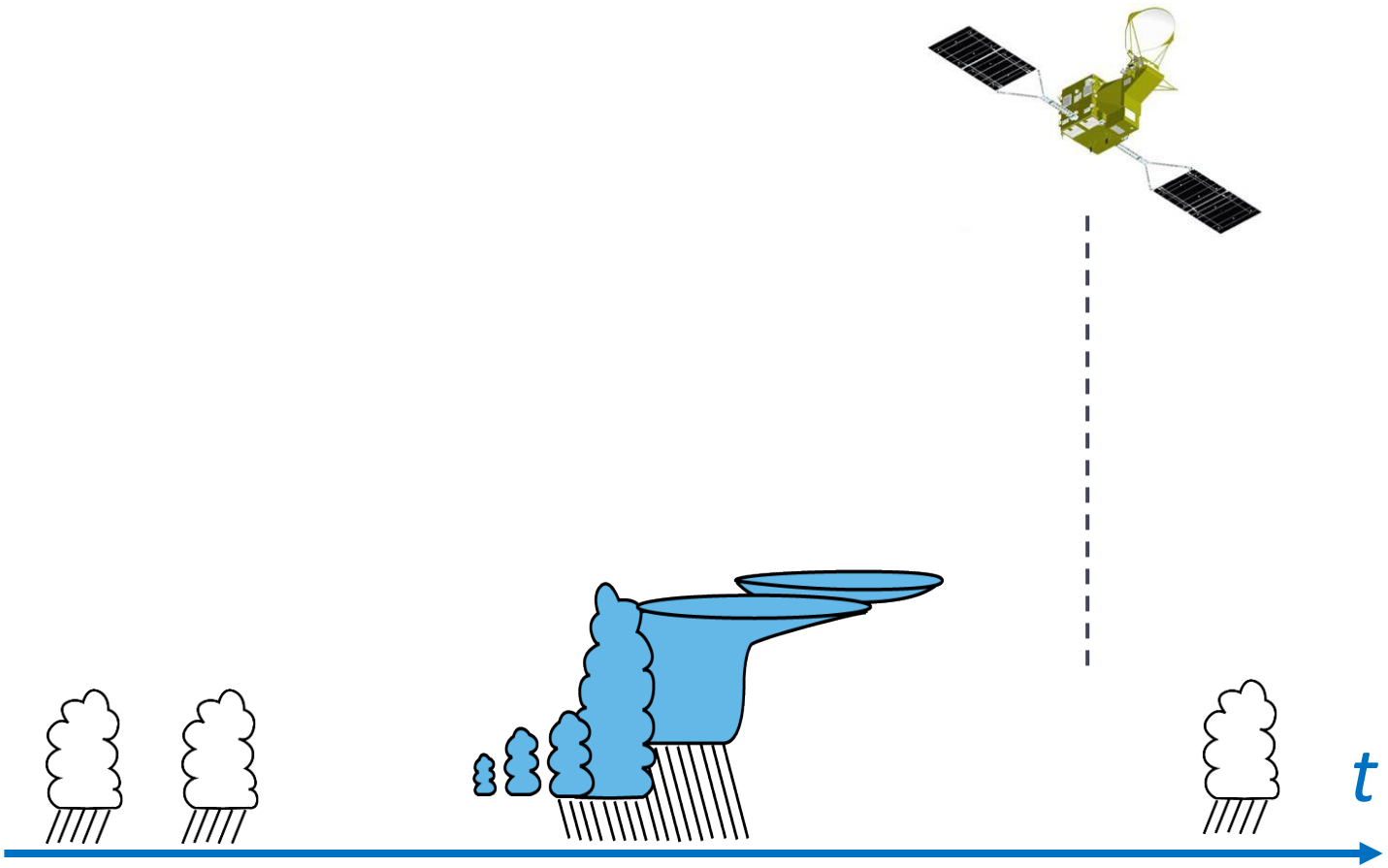
Sparseness of LEO overpasses



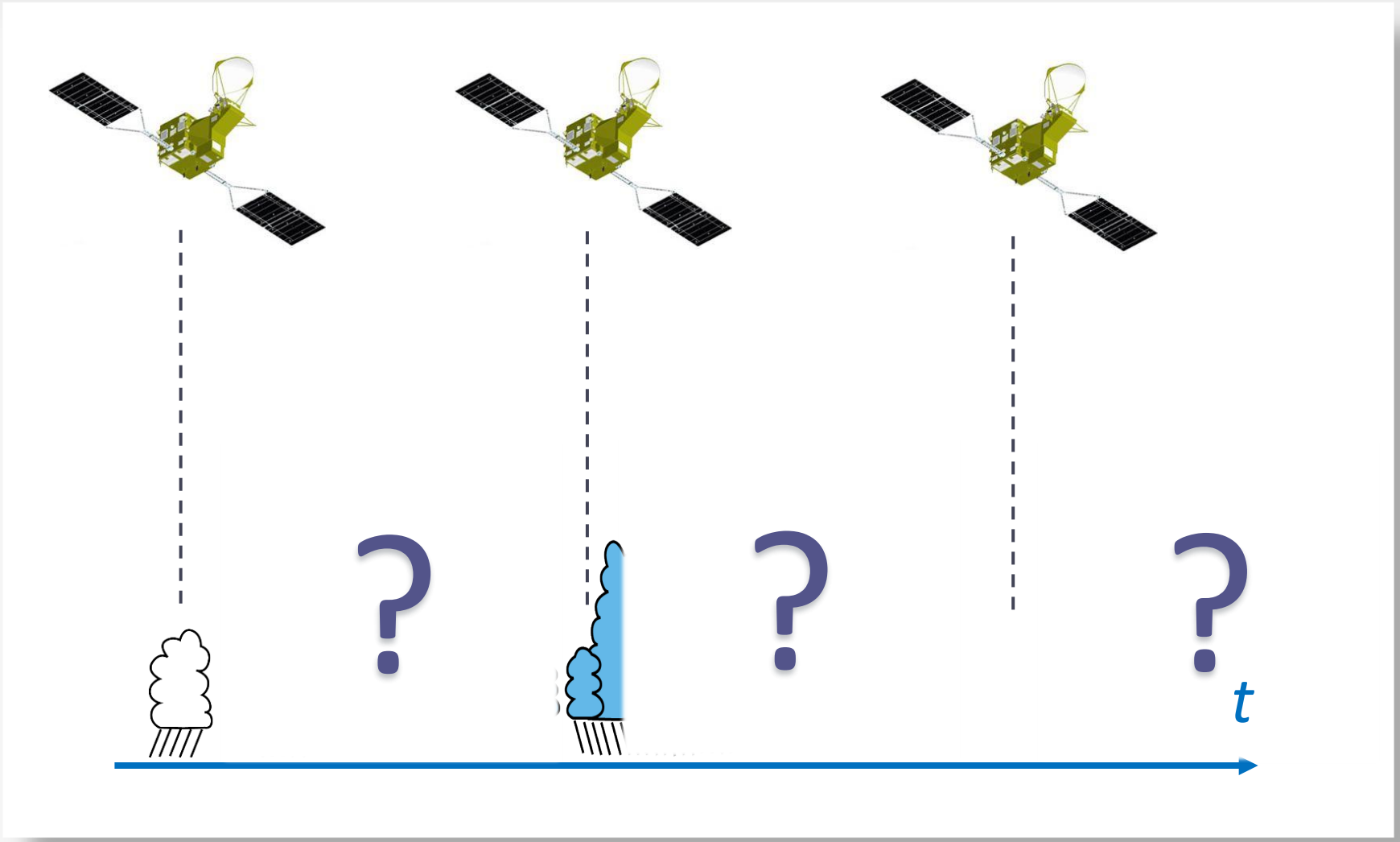
Sparseness of LEO overpasses



Sparseness of LEO overpasses



Sparseness of LEO overpasses



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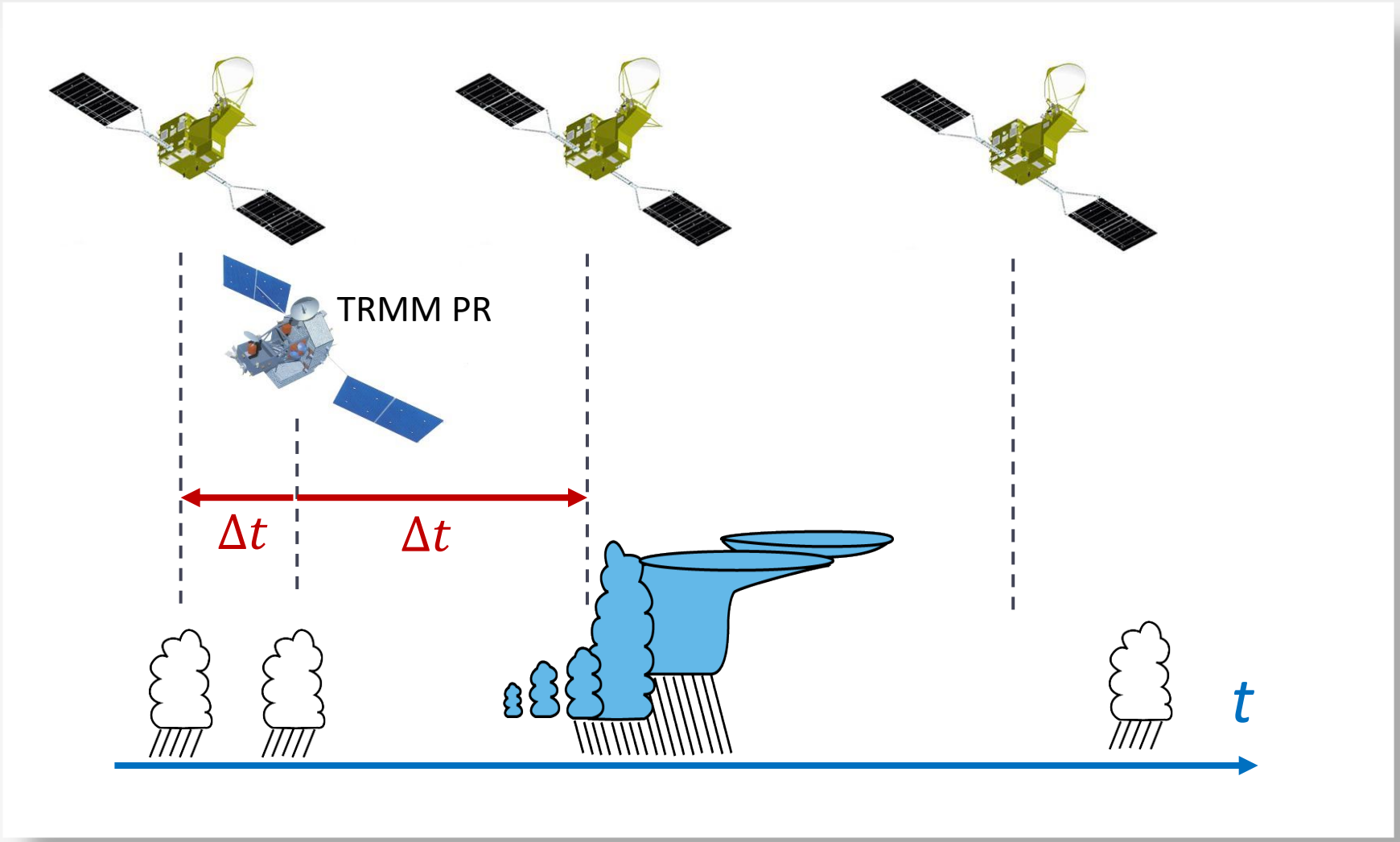
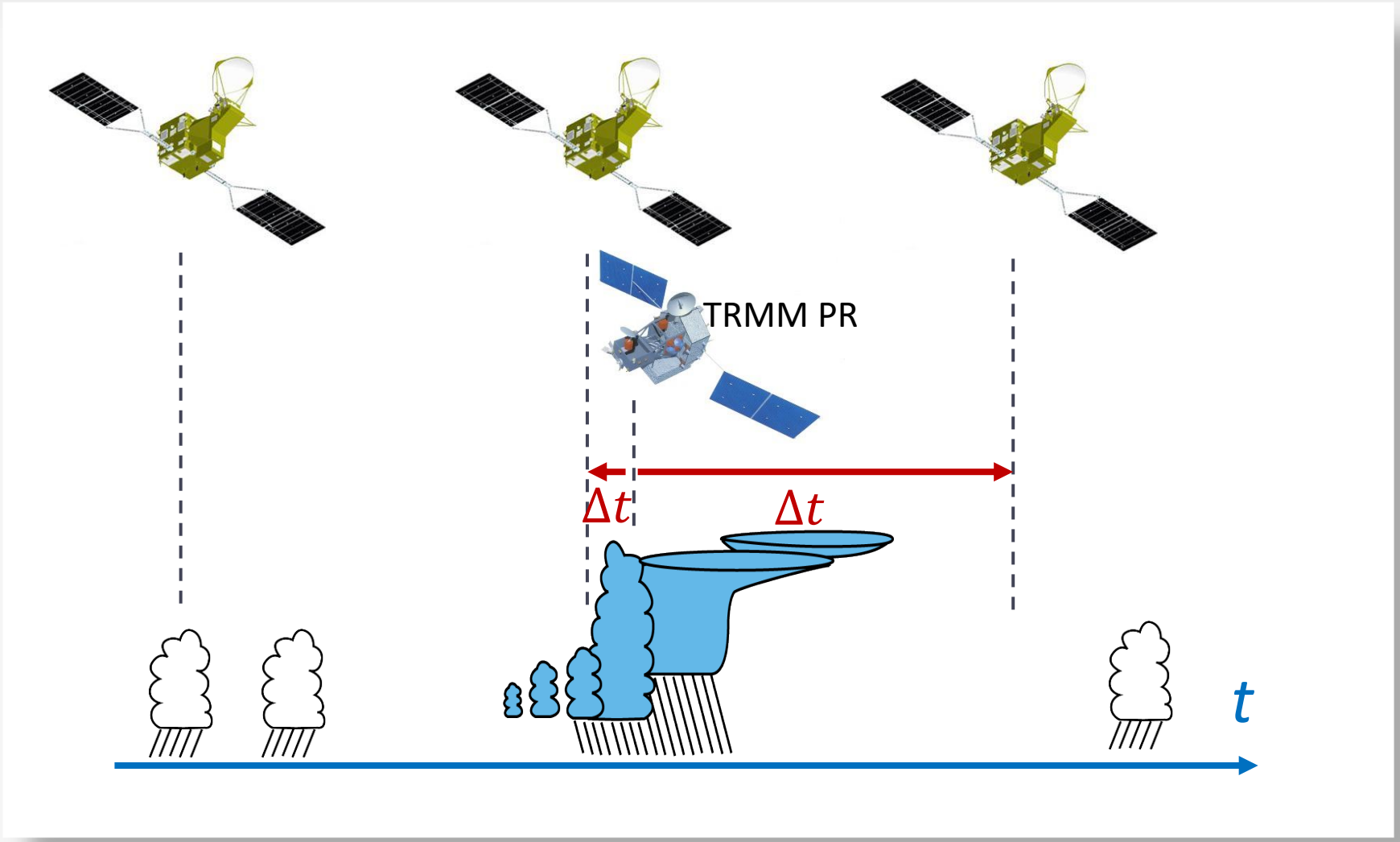
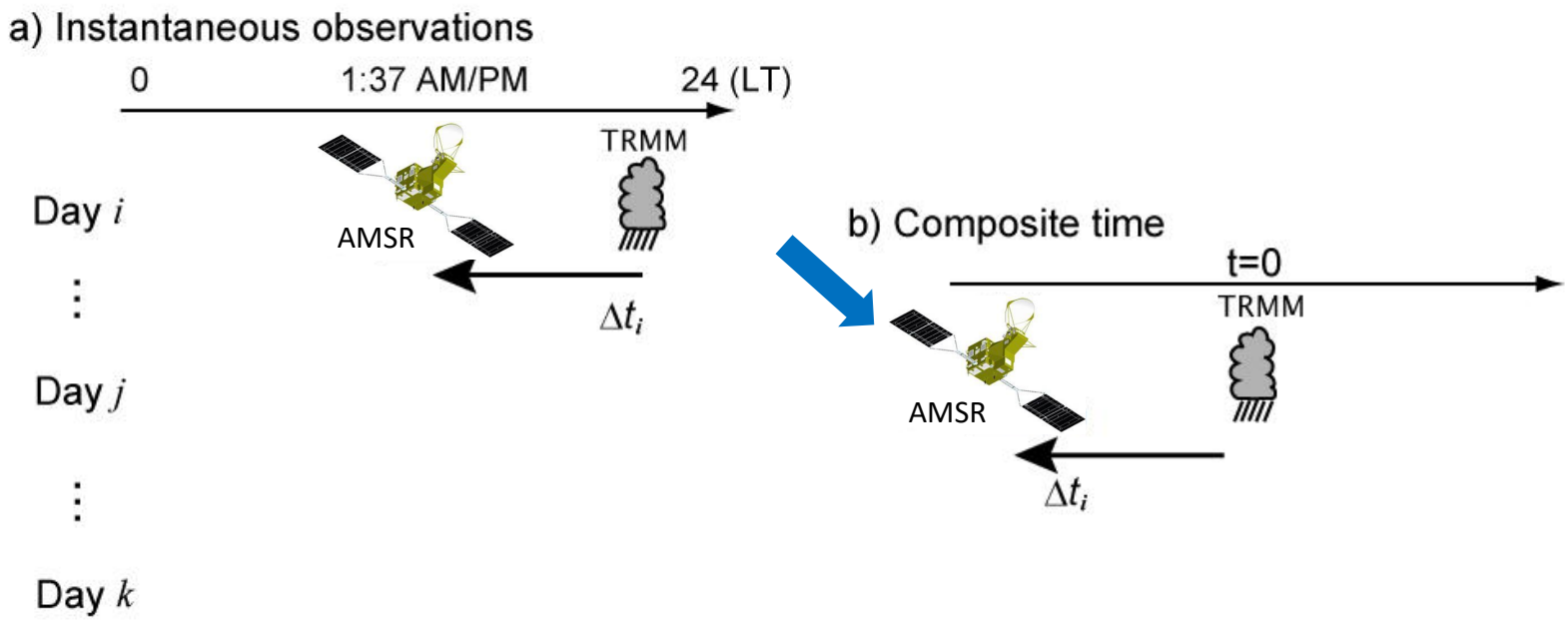


Sparseness of LEO overpasses

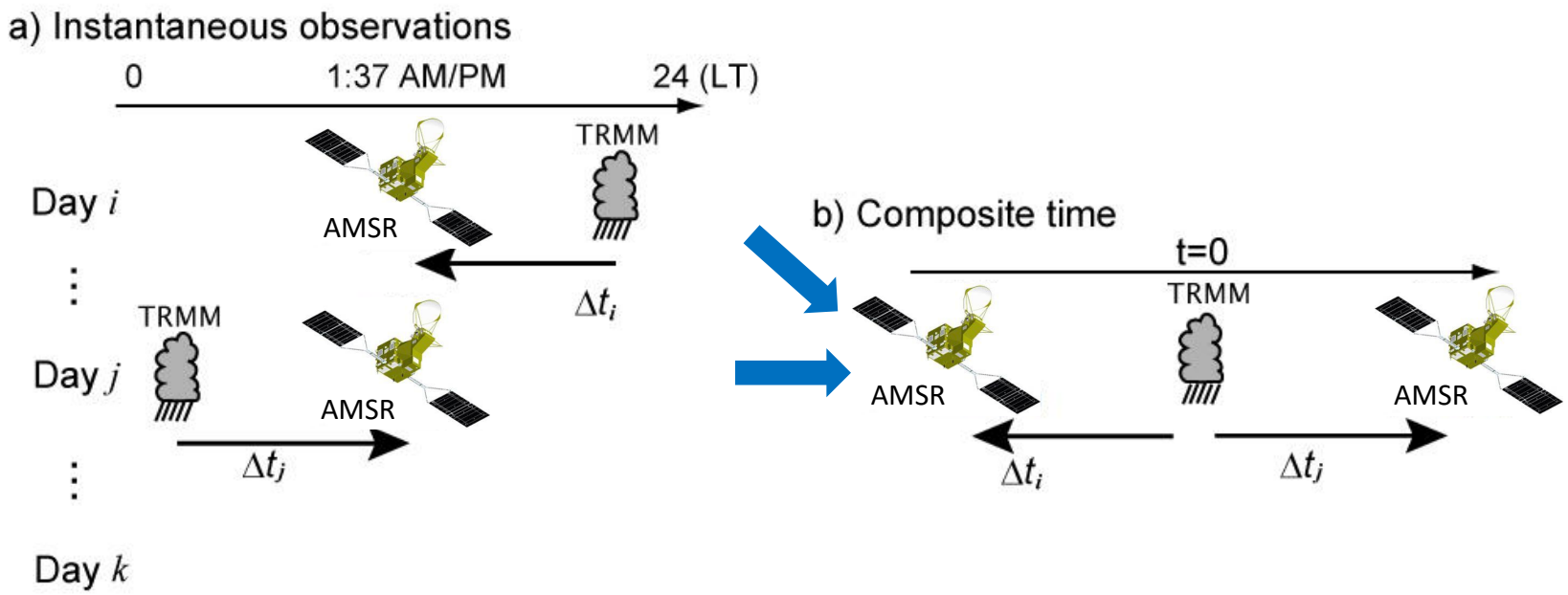


Composite time series: schematic



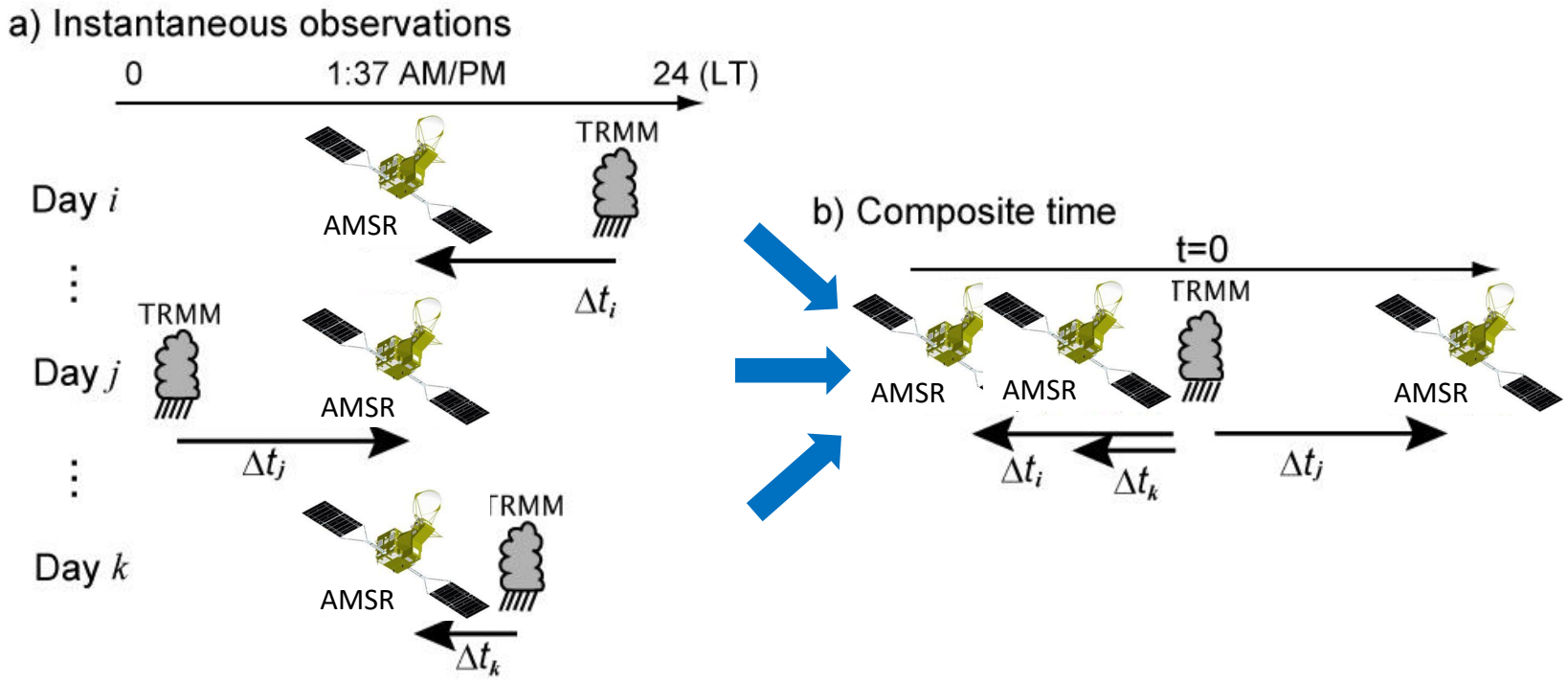
Masunaga, *J. Atmos. Sci.*, 2012

Composite time series: schematic



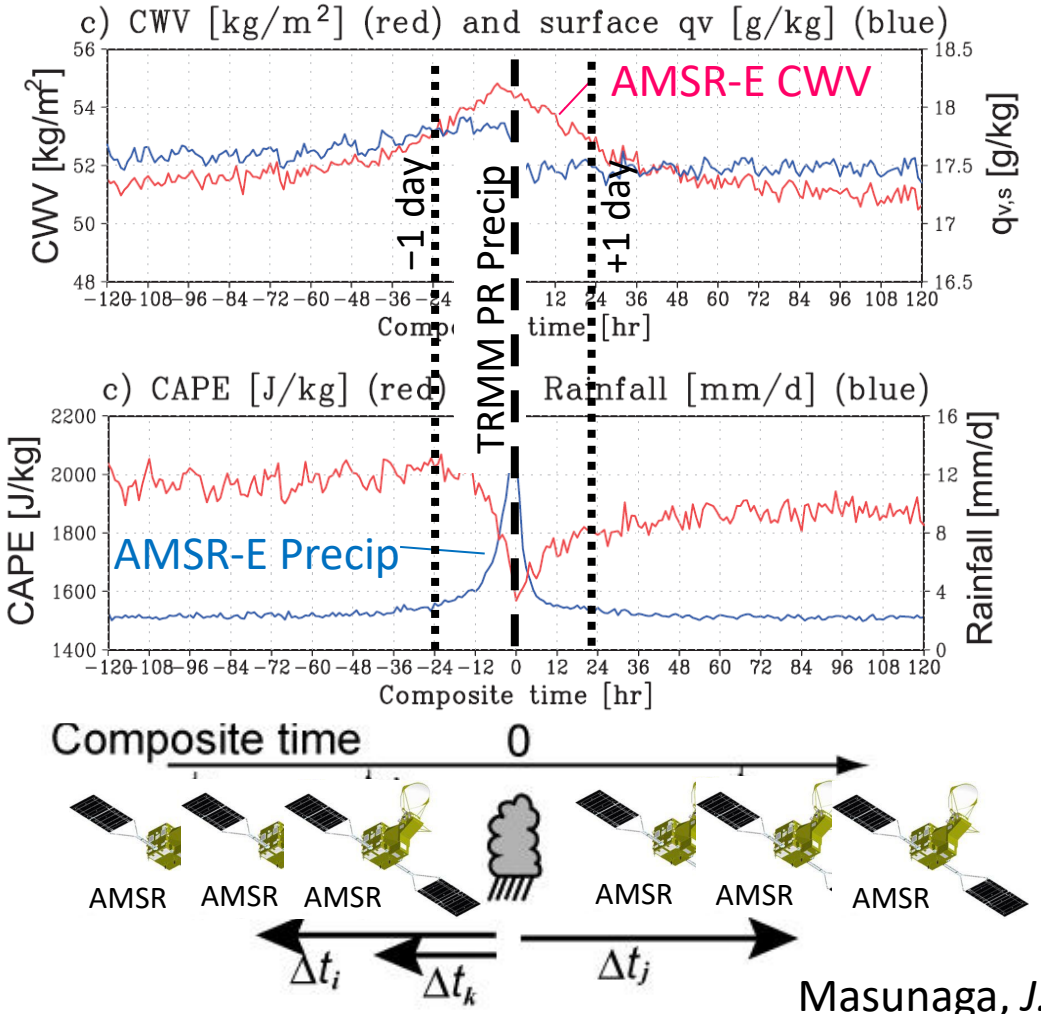
Masunaga, *J. Atmos. Sci.*, 2012

Composite time series: schematic



Masunaga, *J. Atmos. Sci.*, 2012

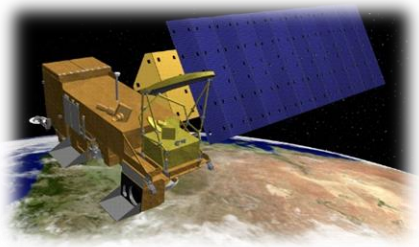
Composite time series: moisture and precipitation



Masunaga, *J. Atmos. Sci.*, 2012

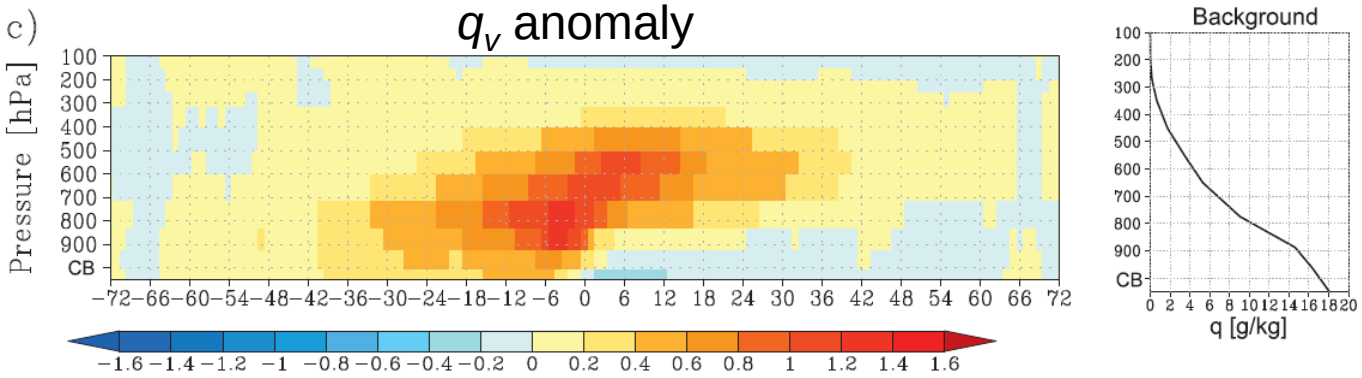
A variety of possibilities: vapor mixing ratio

Aqua AIRS



VS.

TRMM PR



Masunaga, *J. Atmos. Sci.*, 2013

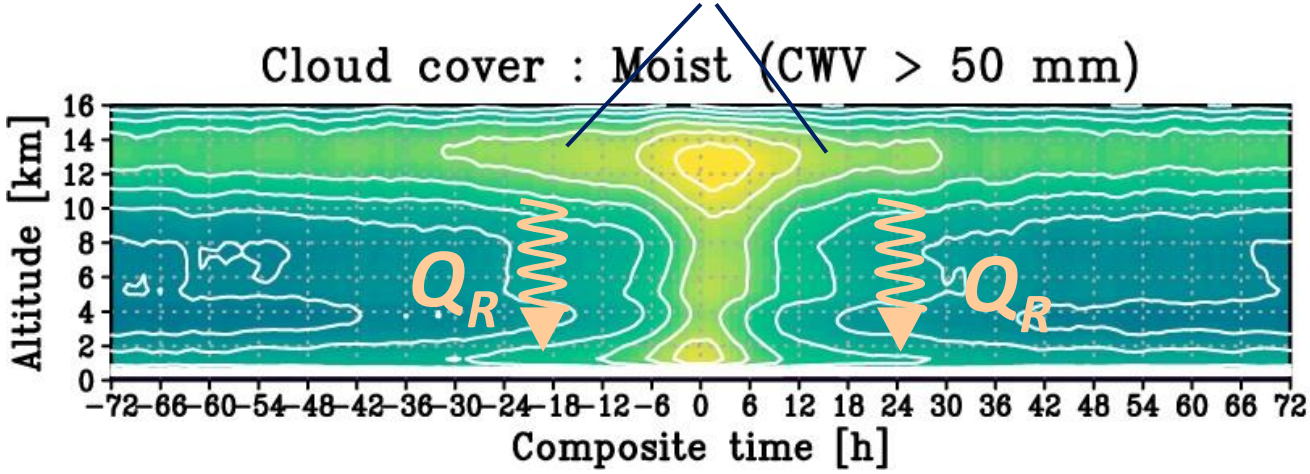
A variety of possibilities: cloud fraction and CRE

CloudSat with CALIPSO

VS.

TRMM PR

Cirrus clouds



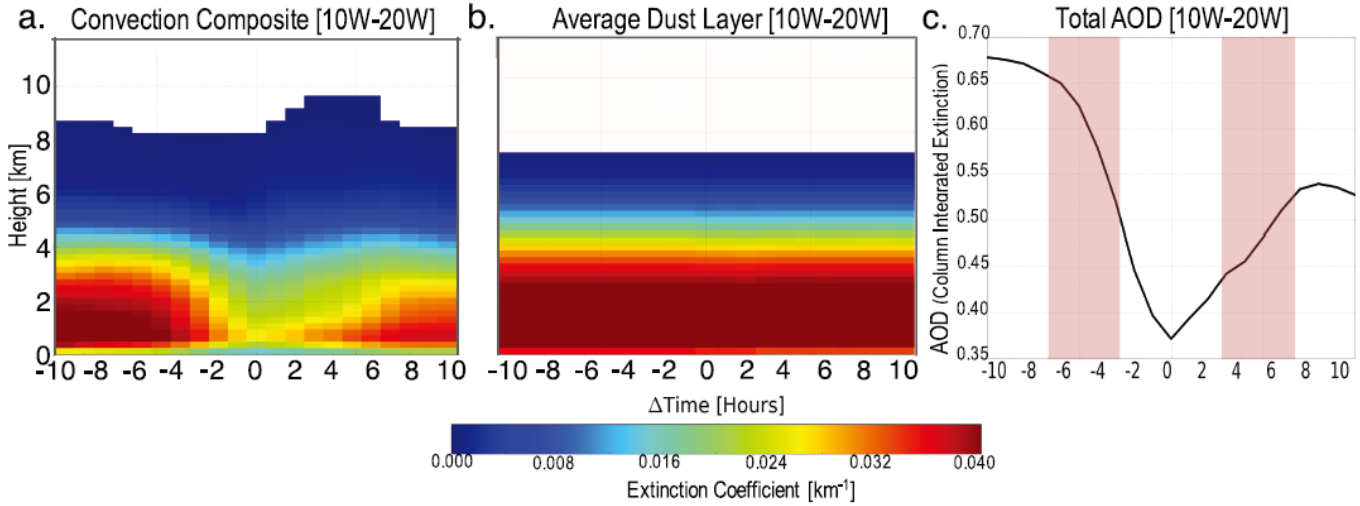
Masunaga and Bony, *J. Atmos. Sci.*, 2018

A variety of possibilities: Aerosol properties

CALIPSO

VS.

GOES/Meteosat

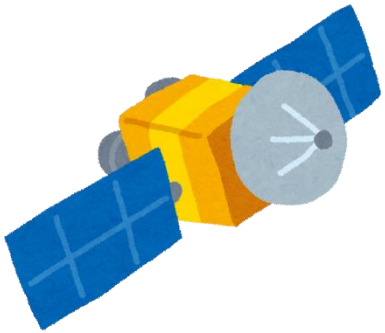


Sauter et al., *J. Geophys. Res.*, 2019

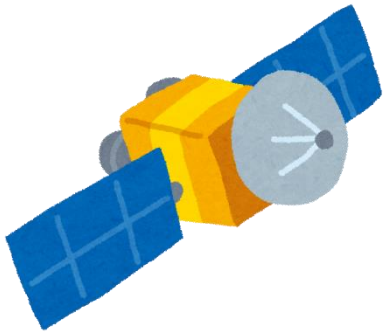
A variety of possibilities: future directions

Sun-synchronous ⟷ Sun-asynchronous

variable Δt



VS.

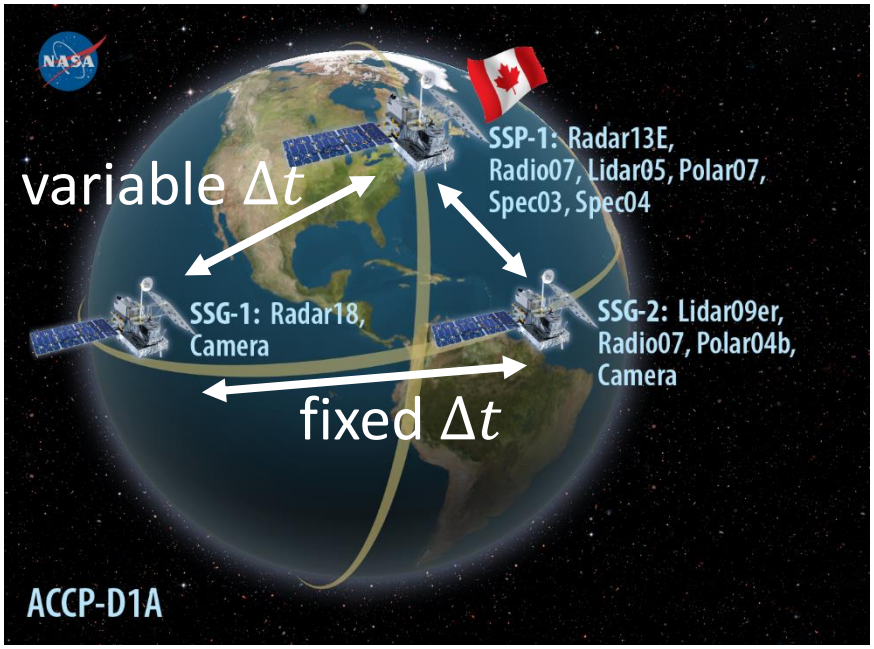


LEO ⟷ GEO

variable Δt

Future missions: ACCP candidate architectures

D1A: Polar and Inclined orbits



variable Δt

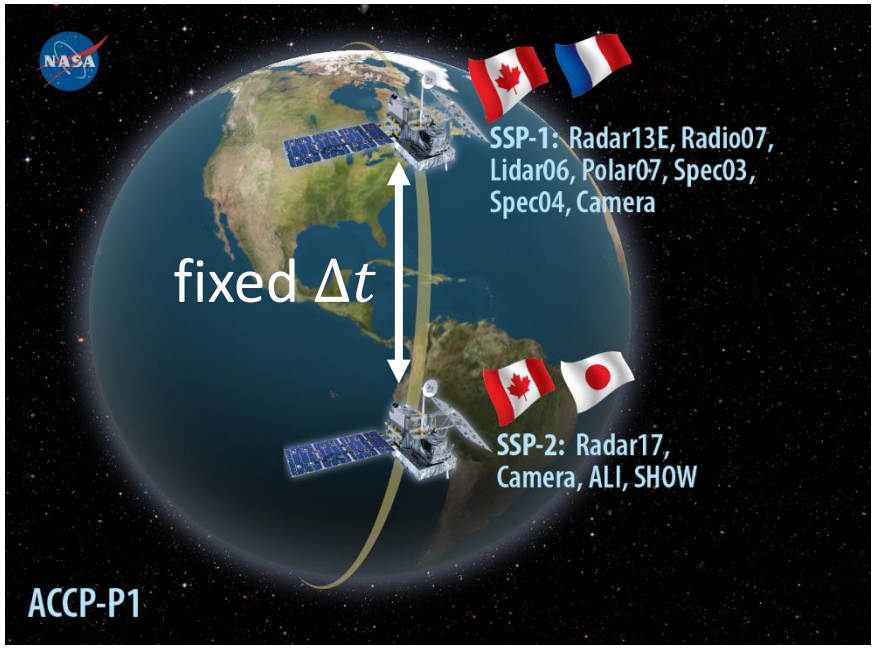
Programs of Record

- GEO satellites
- LEO missions (AMSR3/4 etc.)

Schematic adopted from https://vac.gsfc.nasa.gov/accp/arch.htm

Future missions: ACCP candidate architectures

P1: Polar only



variable Δt

Programs of Record

- GEO satellites
- LEO missions (sun-asynchronous satellites like GPM)

Schematic adopted from https://vac.gsfc.nasa.gov/accp/arch.htm

Summary

- AMSR instruments
  - AMSR/AMSR-E (past), AMSR2 (current), and AMSR3 (future)
  - For monitoring and better understanding the global water and energy cycle and its changes over years.
- Synergy with other missions utilizing variable Δt
  - Composite time series associated with convective variability
    - Lower-tropospheric moistening before convection and drying after
    - Cloud effects on radiative heating (and feedback on convection)
    - Wet deposition of aerosols
  - Future prospects
    - The ACCP mission, in tandem with PoRs, will offer an opportunity to further expand this line of research.