Research plan for the 3rd LS4P-RCM paper

Shiori Sugimoto (JAMSTEC)

Co-authors: Y. Xue, Y. Kun, C. Lin, Y. Ma, J. Tang, T. Sato,

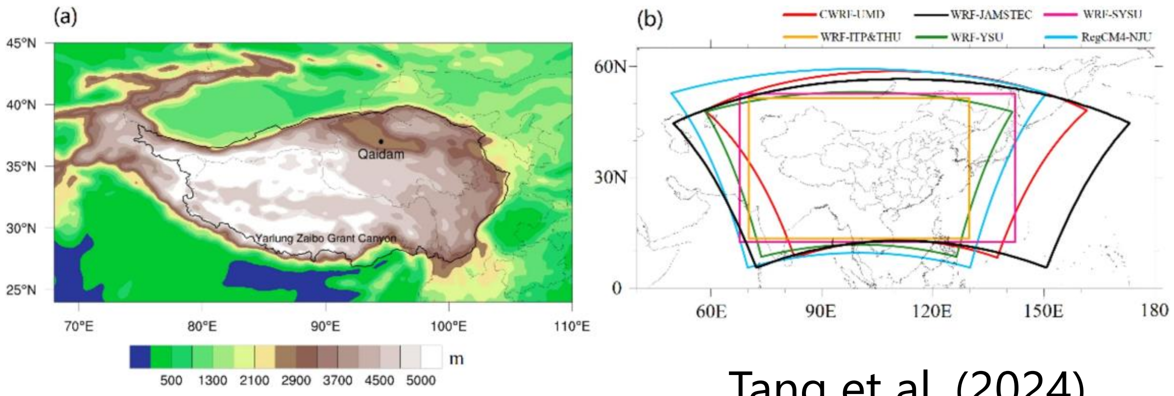
the other RCM members? (depending on the authorship policy)

Rough sketch of our goals expected at this time

A key word: land-atmosphere interaction

Radiation balance components, surface heat fluxes, surface wetness (soil moisture and evapotranspiration,,,): Influences of them on near-surface temperature (and precipitation)

- We have 25-year (1991-2015) of summer simulations covering wide area; therefore, year-to-year variations can be analyzed.
- In-situ observation at 11 stations(2006-2021) provided by Prof. Ma and satellite estimation dataset for evapotranspiration (monthly, 1982~2018; Prof. Ma, daily, 2000~2021: Prof. Li) and soil moisture (2002~, Prof. Lu)
- Overlapped period is 10 years (2006-2015)

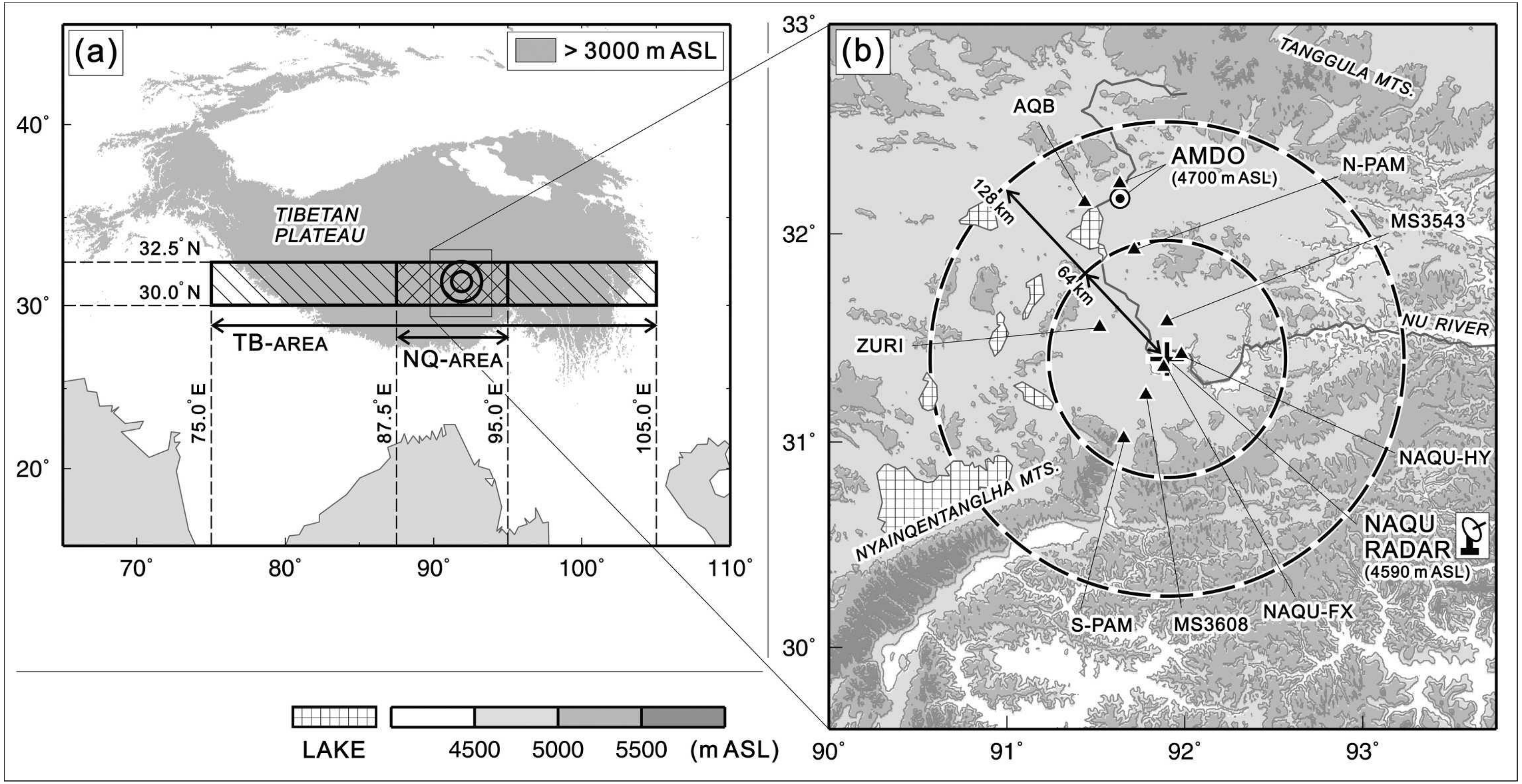


Tang et al. (2024)

To analyze land-surface and near-surface conditions intensively, we should consider active/inactive phase of land-atmosphere interaction over the TP.

Inspired from Yamada and Uyeda (2006)

In this paper, authors focus on seasonal transition of coupling process between precipitation and land wetness (evapotranspiration) from early stage to mature phase of monsoon season in 1998.



At Amdo

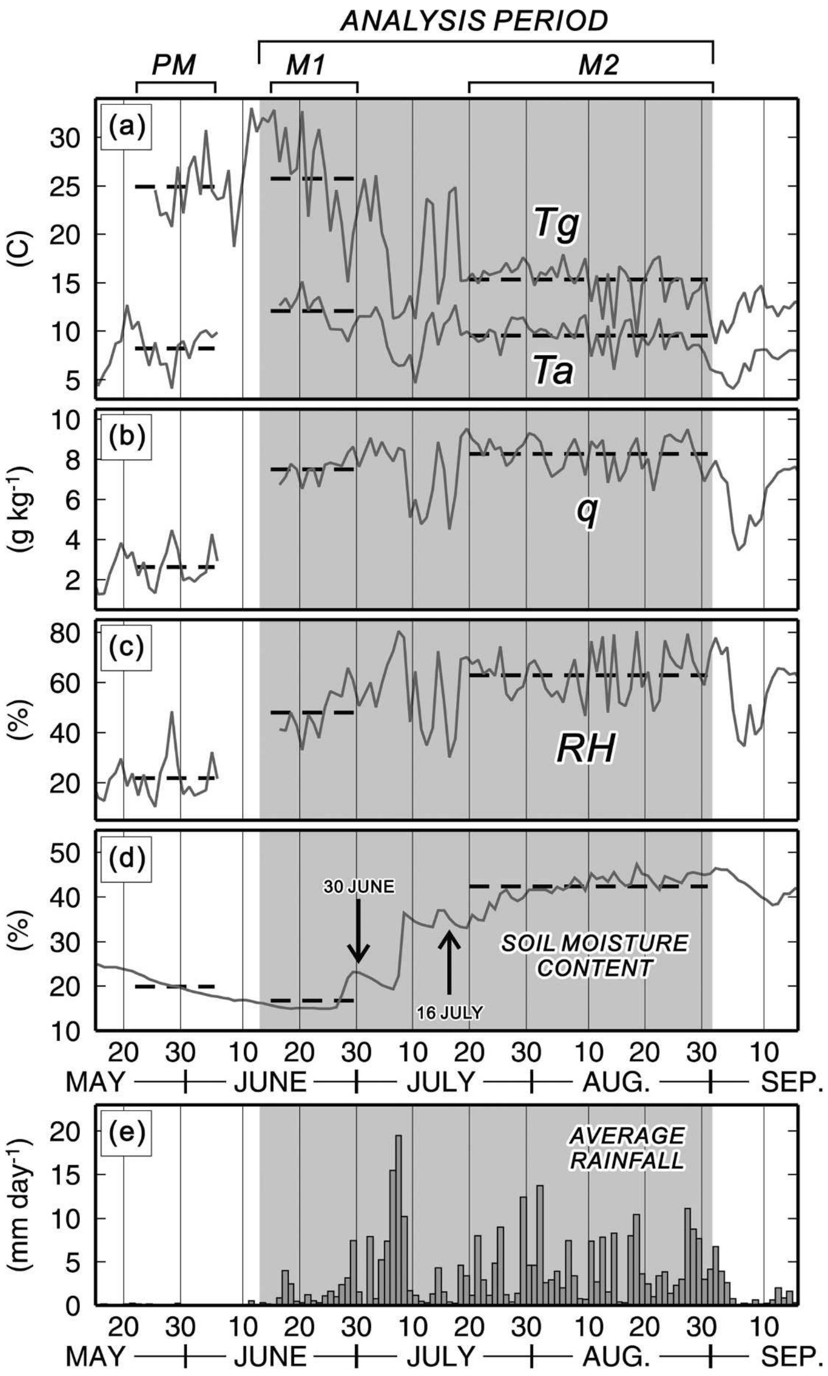
Tg: land-surf Temp
Ta: near-surf Temp

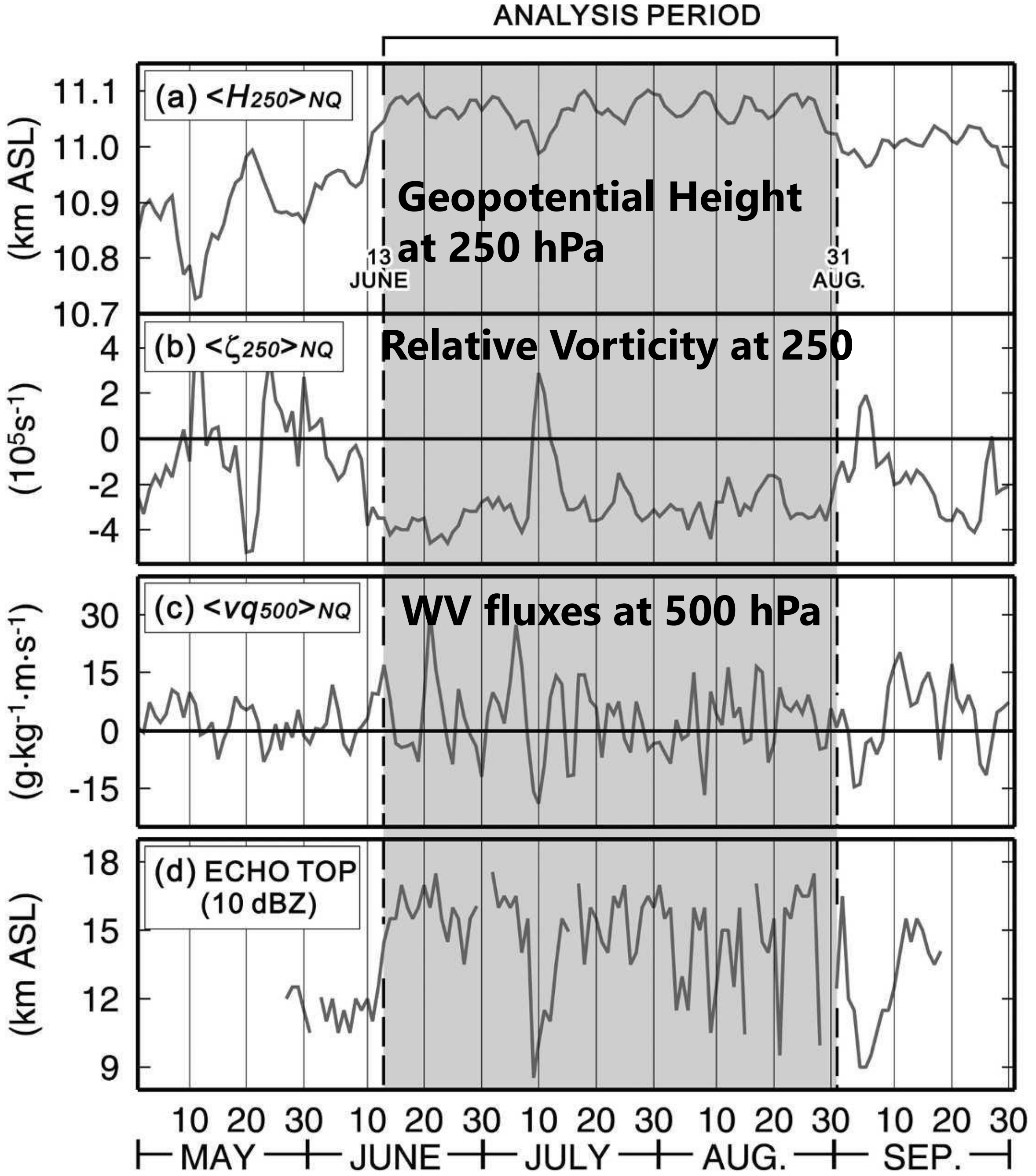
Mixing ratio

RH

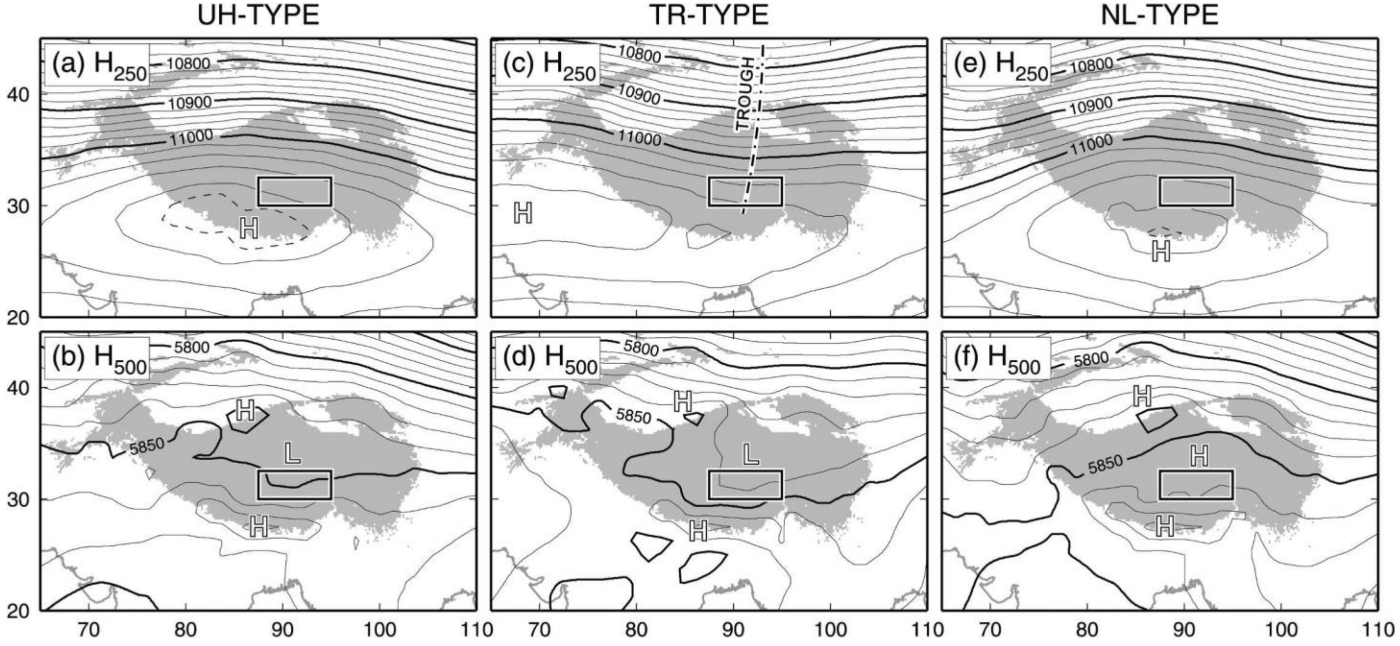
Soil moisture

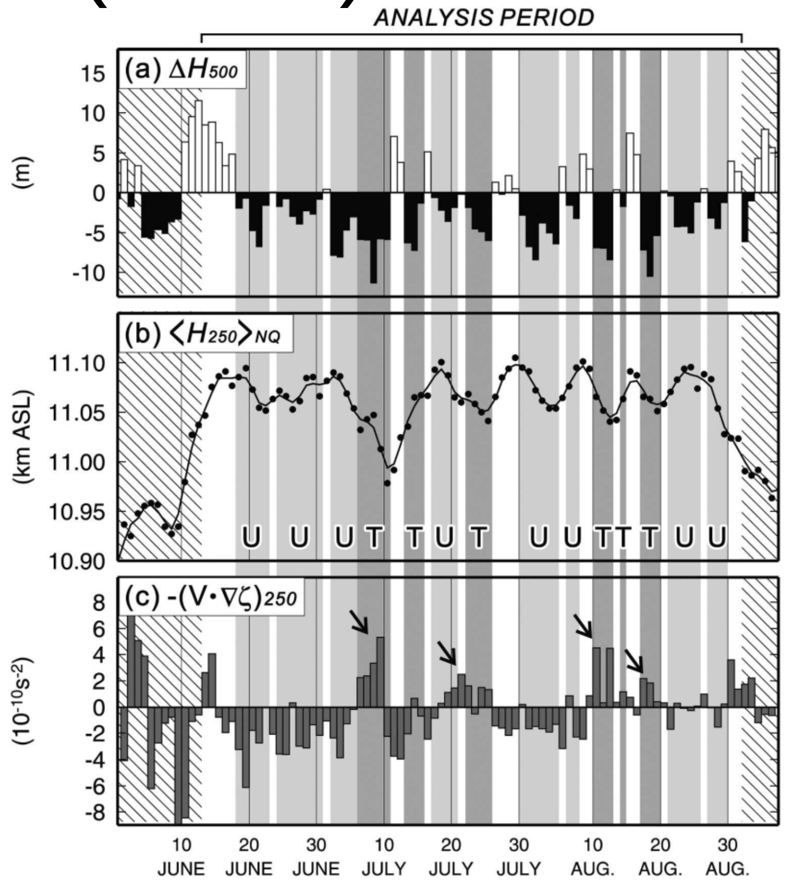
Precip





Inspired from Yamada and Uyeda (2006)



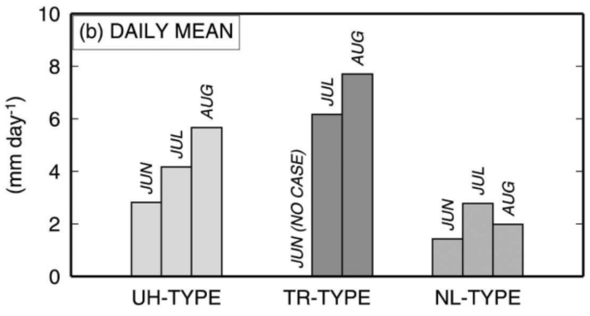


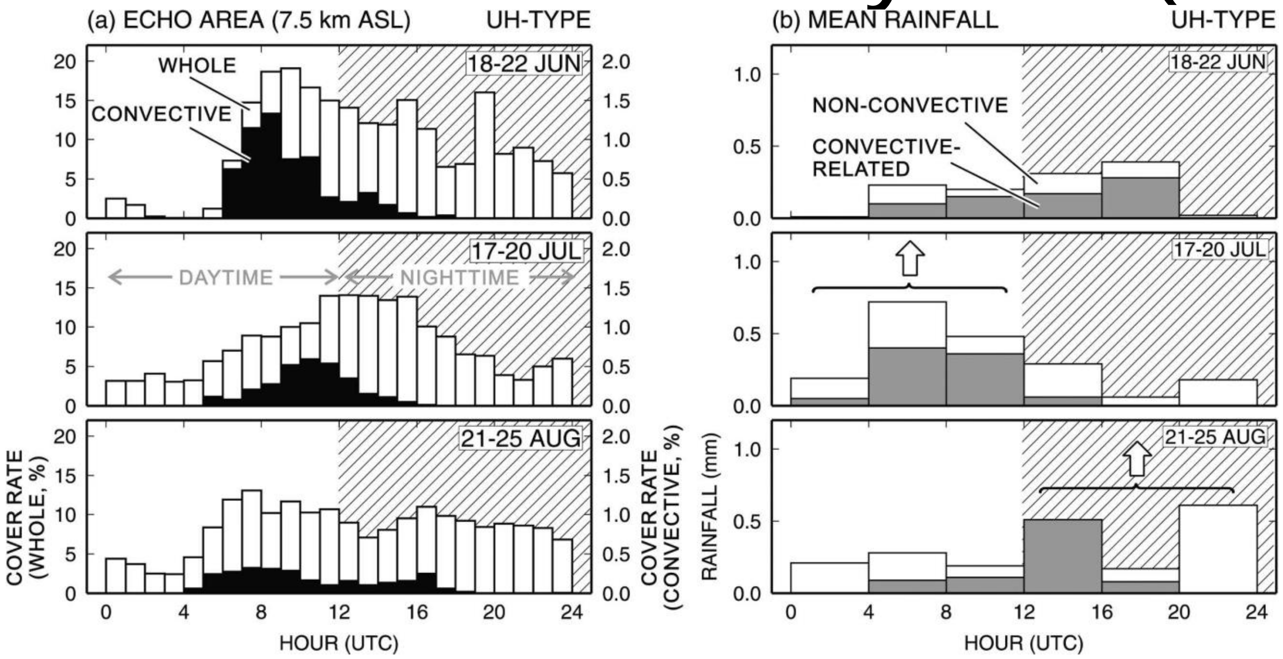
UH (Upper High): Development of the SAH at 250 hPa and thermal low at near-surface
TR (TRough): Passage of synoptic-scale trough
NL(No-Low): Low pressure system does not exist at 500 hPa

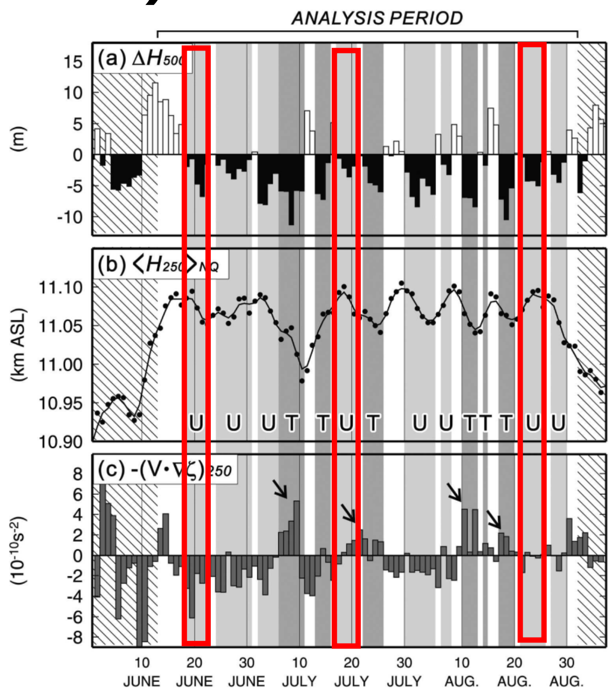
Empirically,
UH is expected as active phase for land-atmosphere interaction.
TR is expected as much moisture supply from outside of the TP

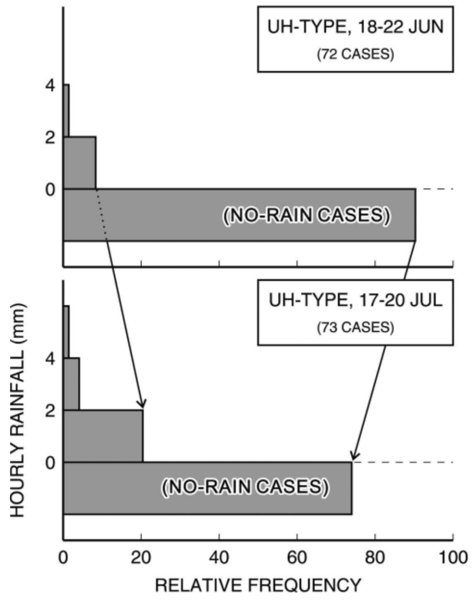
	UH	TR	NL
June(13-30)	12	0	6
July (1-31)	10	12	9
August (1-31)	14	7	10
Total	36	19	25

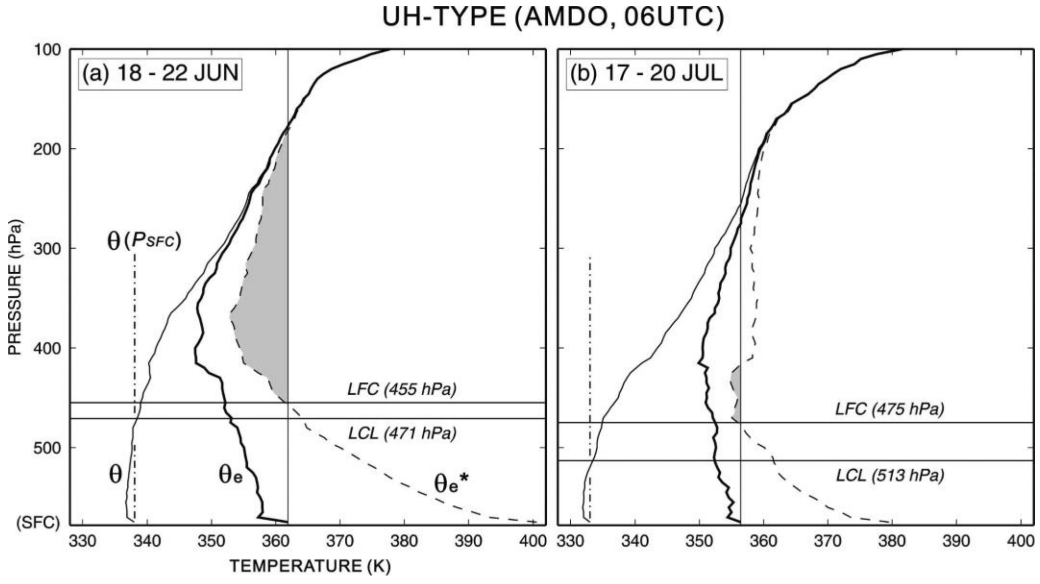
Inspired from Yamada and Uyeda (2006)



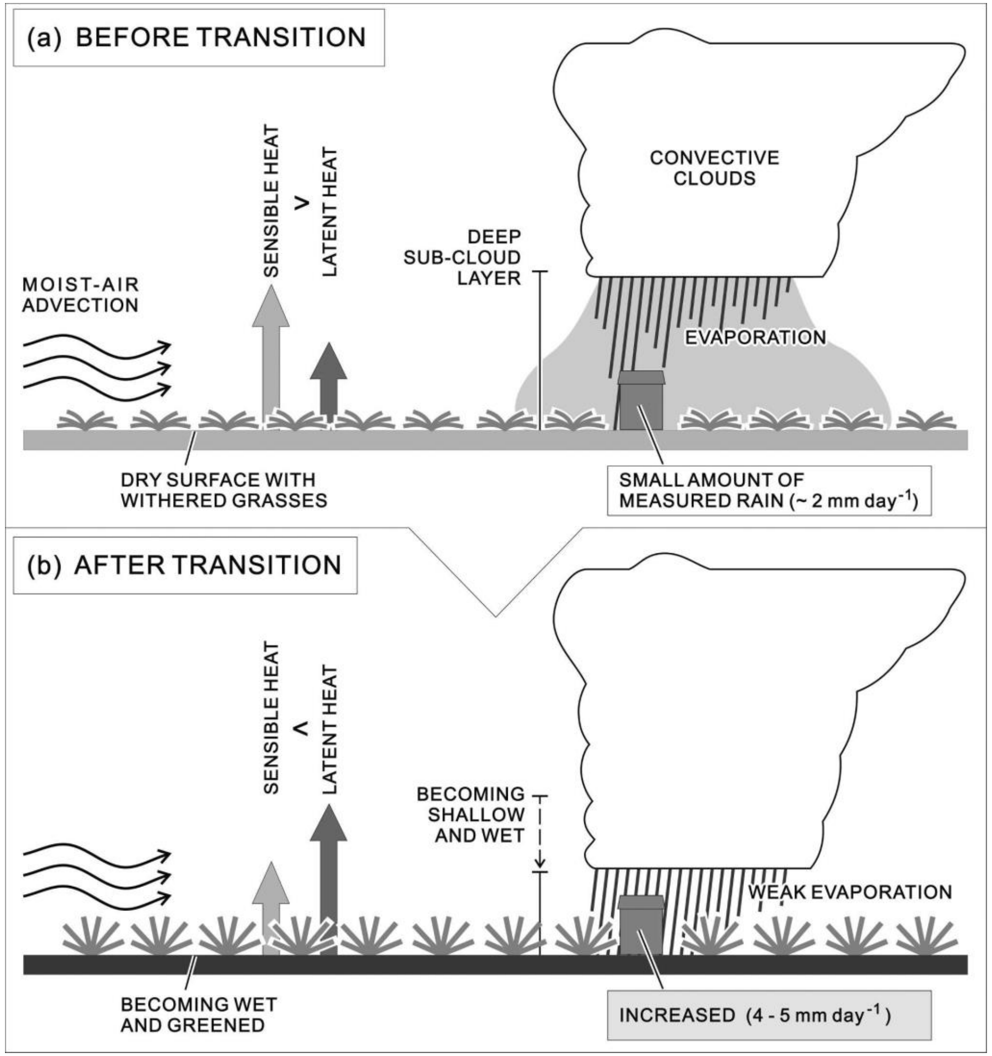








Inspired from Yamada and Uyeda (2006)



- Classification of synoptic-scale conditions

When we would like to focus on the land-atmosphere interaction in our next paper, we should analyze the "UH-type" days intensively and will compare to other synoptic condition types.

- Year-to-year variability

Yamada and Uyeda examined only one summer.

My research plan

[Fact check]

1. Synoptic-scale conditions are classified into three types using ERA-interim.
2. Atmospheric conditions on the detected days are confirmed for each three types.
3. Radiation and surface heat fluxes are analyzed for each three types using in-situ observation dataset, and difference of them among the three types are examined. Spatial distribution dataset for evapotranspiration and soil moisture may also use to confirm land surface wetness condition in the area without in-situ observation dataset.
4. Year-to-year variations in the synoptic-scale conditions and land-atmosphere coupling process are examined.

e.g.)
statistic characteristics for occurrence frequency of three synoptic-scale conditions (each month, each year)
relationship between occurrence frequency of the UH type cases and strength of near-surface heating
whether frequency of the UH-type in June is related to precipitation over the Yangtze River Basin or not

[Model validation]

5. Simulation accuracy for atmospheric conditions are evaluated in each types
6. We try to examine how surface heat fluxes and radiation are simulated in the model
(how land-atmosphere coupling process is simulated in the model)

Direct evaluation between in-situ observed land surface parameters and simulations with 20-km horizontal resolution will be quite difficult and/or impossible. So, both good points and challenging issues of the model simulation are described, and we discuss how we could modify the issues including the LS4P-RCM datasets.