UC7-110, EMS2016 in Trieste, ITALY
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Low pressure (LP) and rainfall around Mongolia in summer

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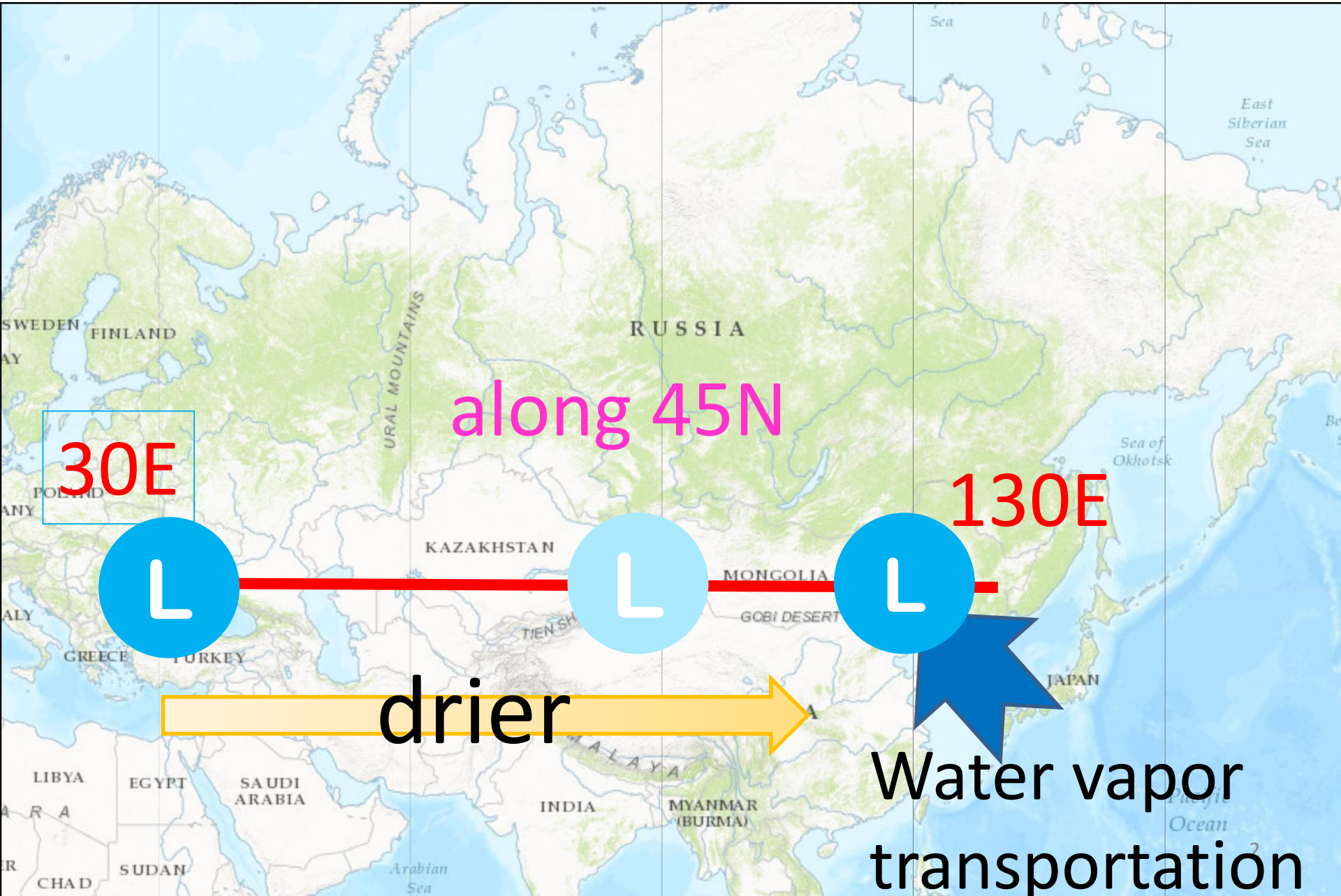
Contents

0. Image of this study



1. Introduction

- Over Eurasian Continent, most of low pressures(LPs) are moving from Europe via Siberia to Mongolia by westerly wind.
- Near Atlantic Ocean, LP is consisted with wet air. While LP moves over large Eurasia Continent, air mass has been changed to drier gradually.
- When LP reaches to the eastern Mongolia, it has influenced from the Ocean again. The south-eastern wind from Japan Sea brings humid to the air mass.

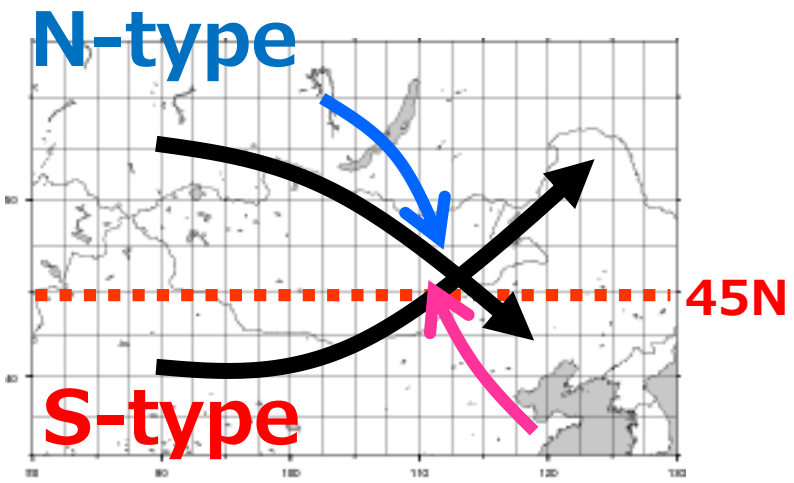
Purposes of this study

- When LP moves over the Eurasian Continent from east to west,
  - the change of LP structure is clarified as it moves, and
  - the distribution of rainfall is clarified.

- Main themes are these four:
  - Relationship between rainfall area and LP
  - Distribution of rainfall and altitude
  - Difference of the speed when LP moves eastward, and
  - Change of structure of LP

Study area

- When rainfall is observed in Mongolia, the analyze about the moving LP eastward is held along 45N degree which is the boundary of the moving LP (Kimura and Shinoda, 2010).
- Study area is between 30E and 130E because LP is traced over the Eurasian Continent.



Kimura and Shinoda (2010)

Black : trace of LP
Blue : water vapor transportation from NW
Pink : water vapor transportation from SE

2. Data

ERA-Interim (ECMWF)

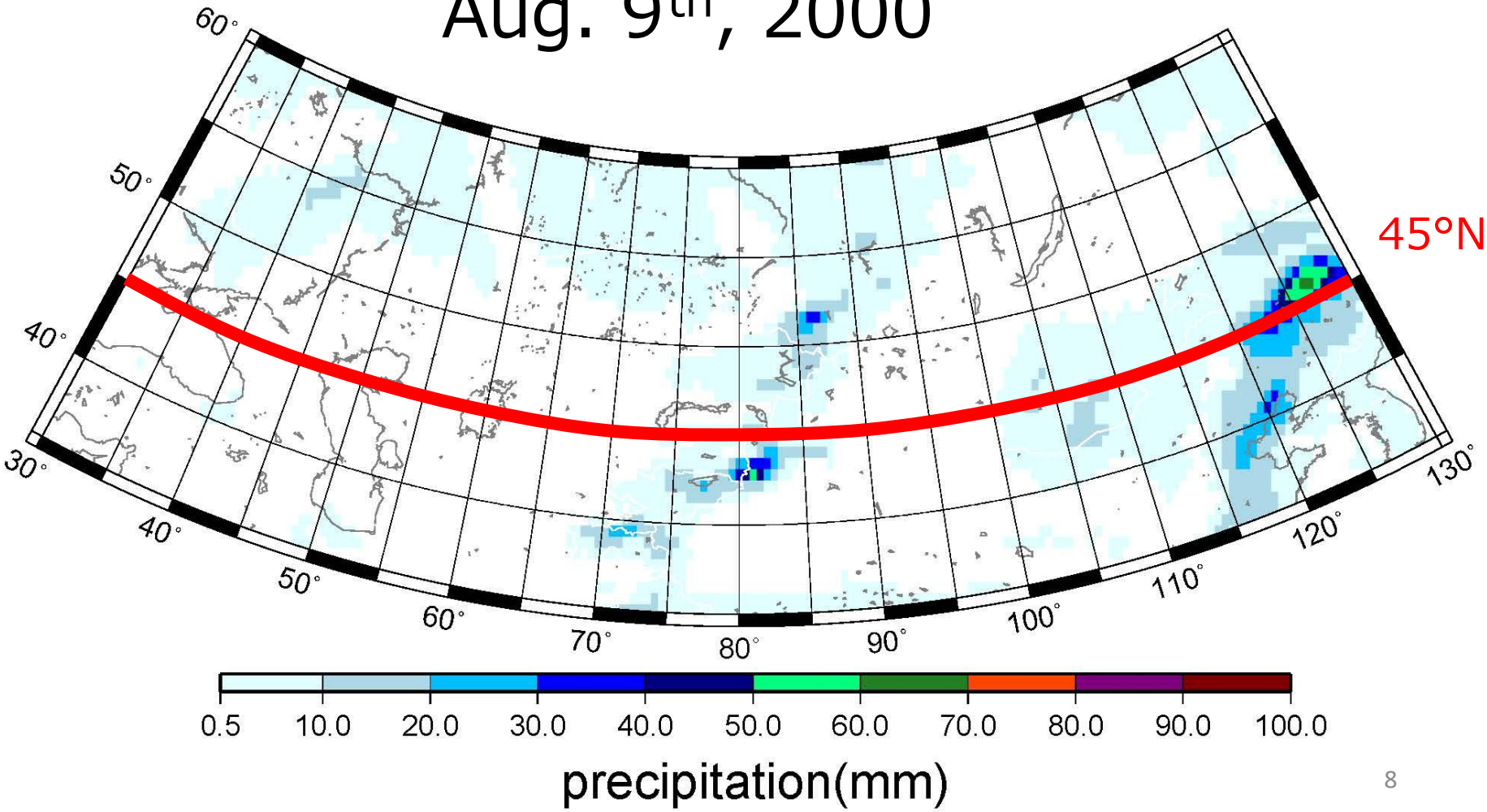
- Period : July～Sept. in 1979～2015
  (Especially Aug. in 2000, in this presentation)
- Area : 30～60°N (Especially 45°N) , 30～130°E
  0.5 degree grid
- Components and time :
  ① SLP (00UTC)
  ② rainfall amount (summarized amount of 00UTC+12UTC)
  ③ height, temperature, UV-wind, specific humidity
  (00UTC)
  23 layers (200～1000hPa)
- altitude data

Methods

- Longitude-Time section and Longitude-altitude section along 45°N
  - → Distribution of rainfall and its movement eastward
  - → Comparing between the distributions of rainfall and the LP
  - → about the LP moving speed
- Factors about rainfall increase with the same LP
  - → ① altitude
    ② water vapor transportation
  - → Rainfall amount increases because of the change of LP structure

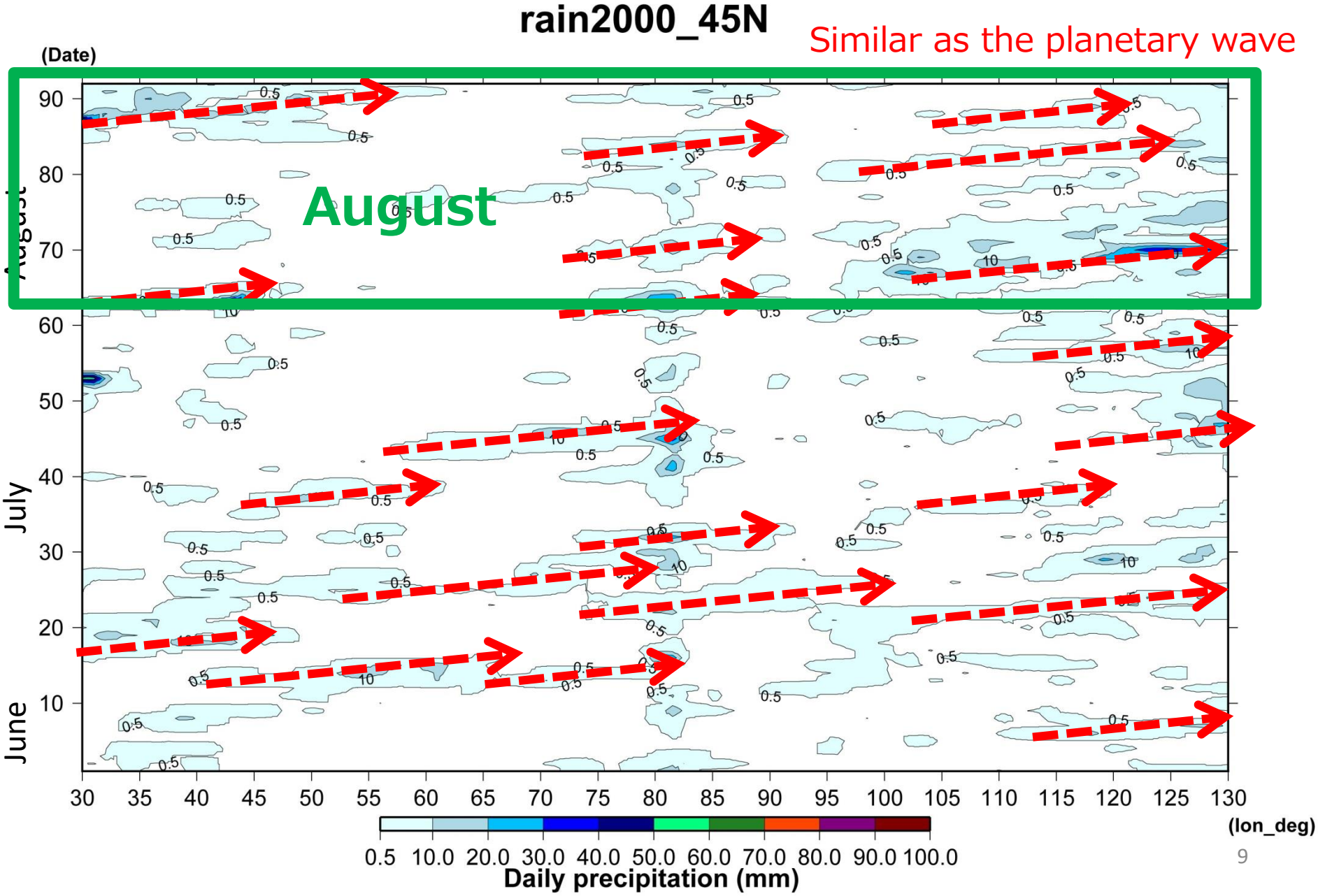
3. Rainfall distribution

Aug. 9th, 2000



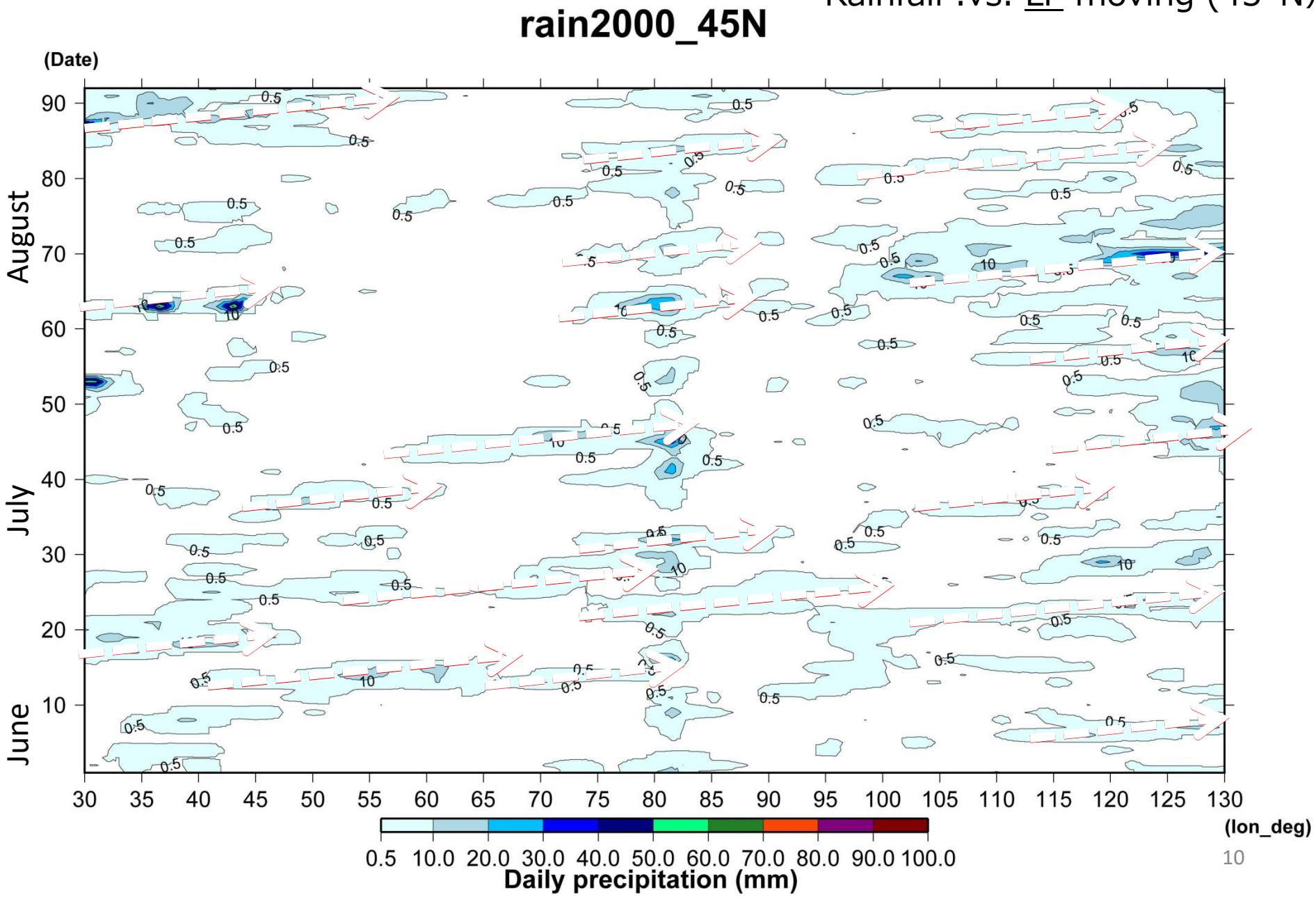
4. Rainfall area moving

Along 45N,
in summer 2000

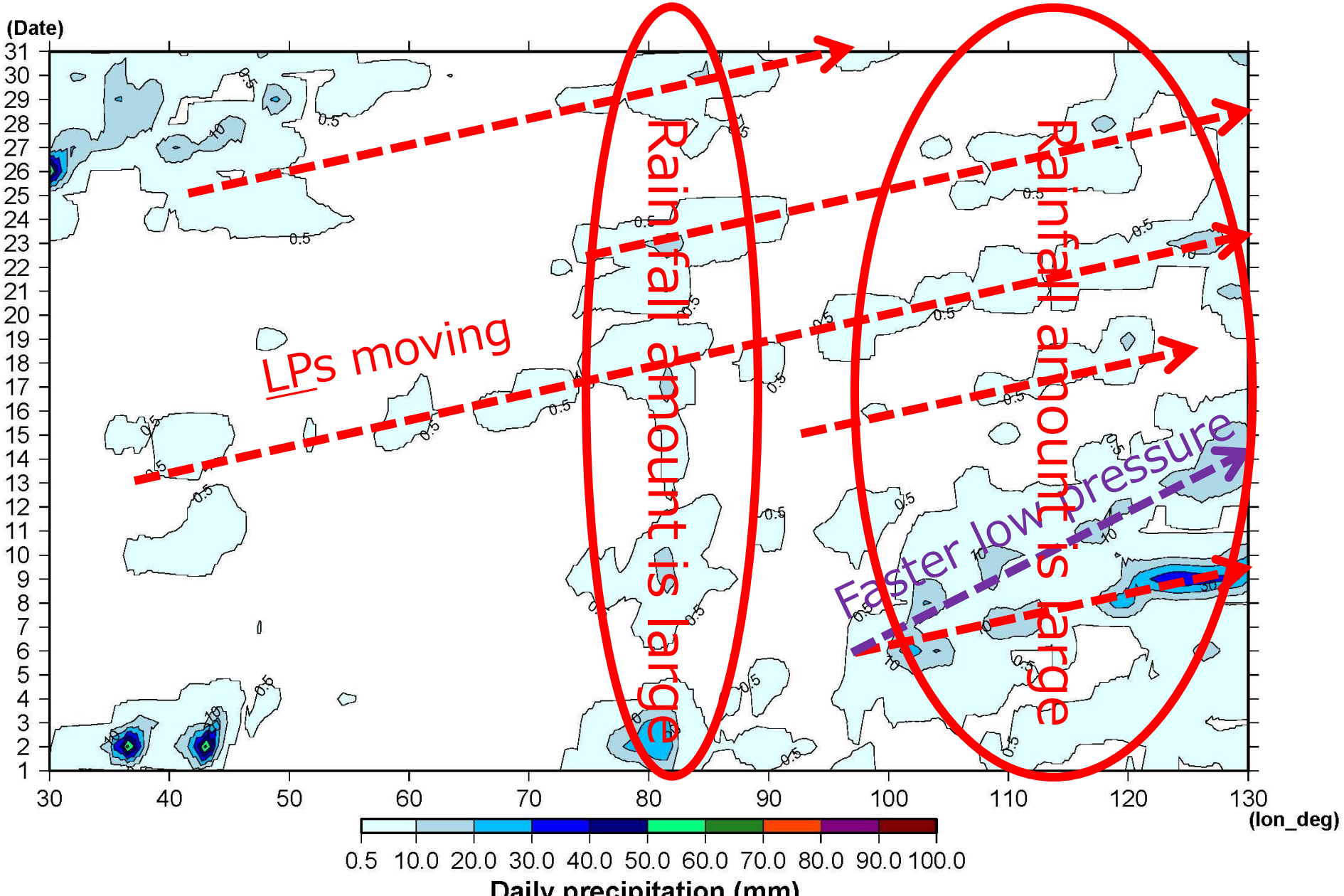


4. Rainfall area

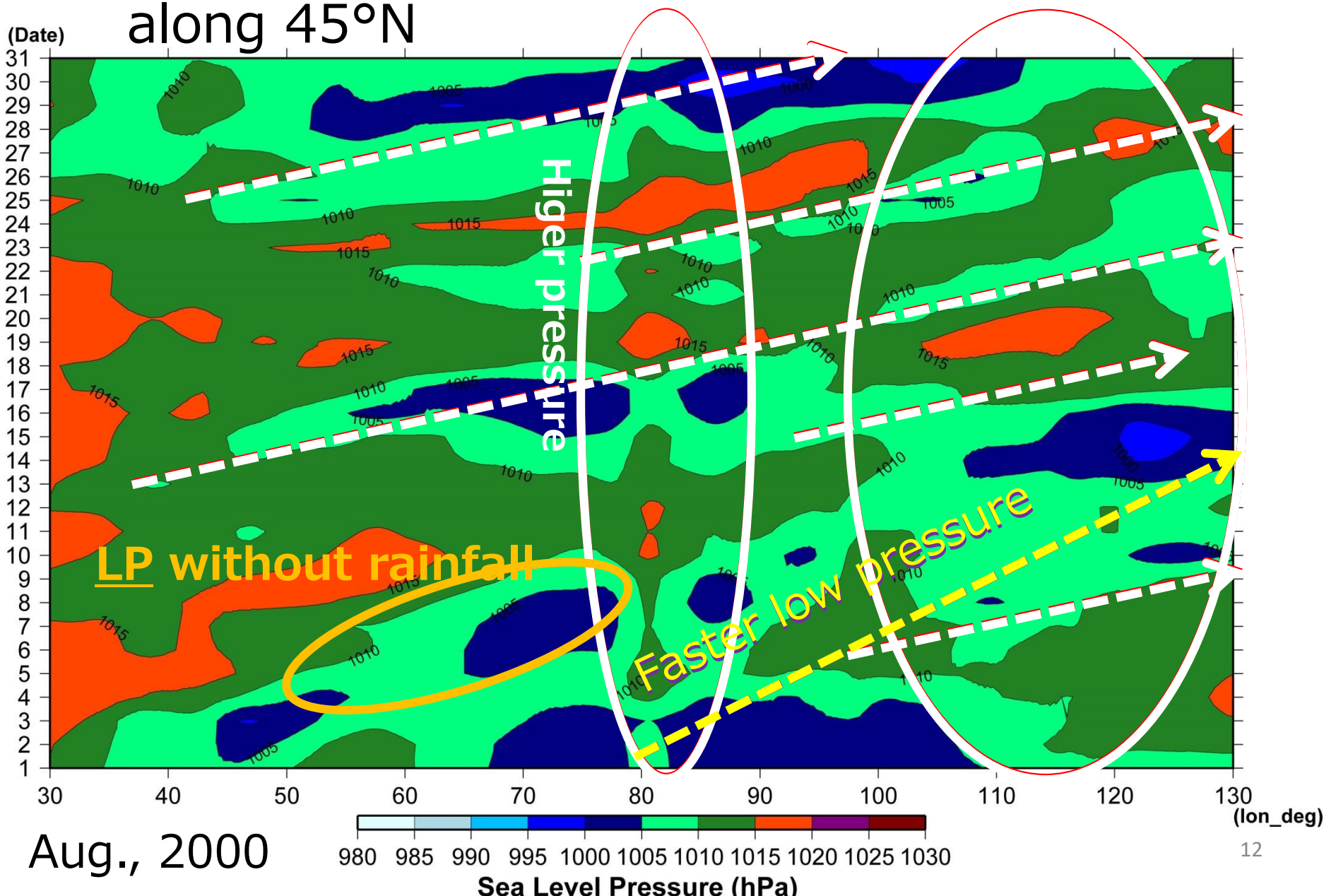
Rainfall .vs. LP moving (45°N)



Rainfall amount along 45N in Aug., 2000

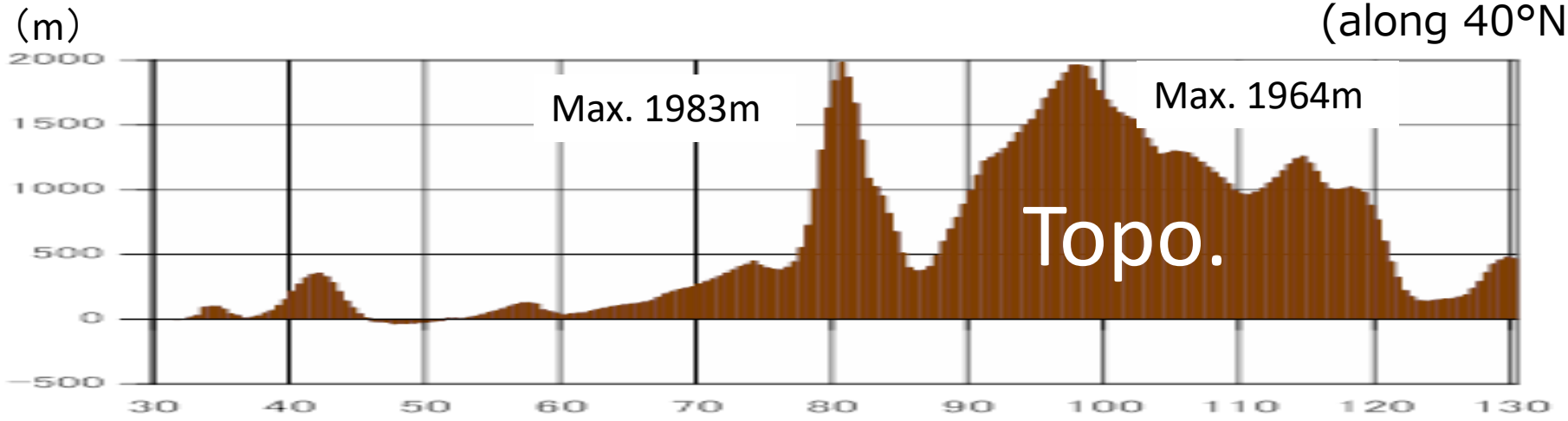


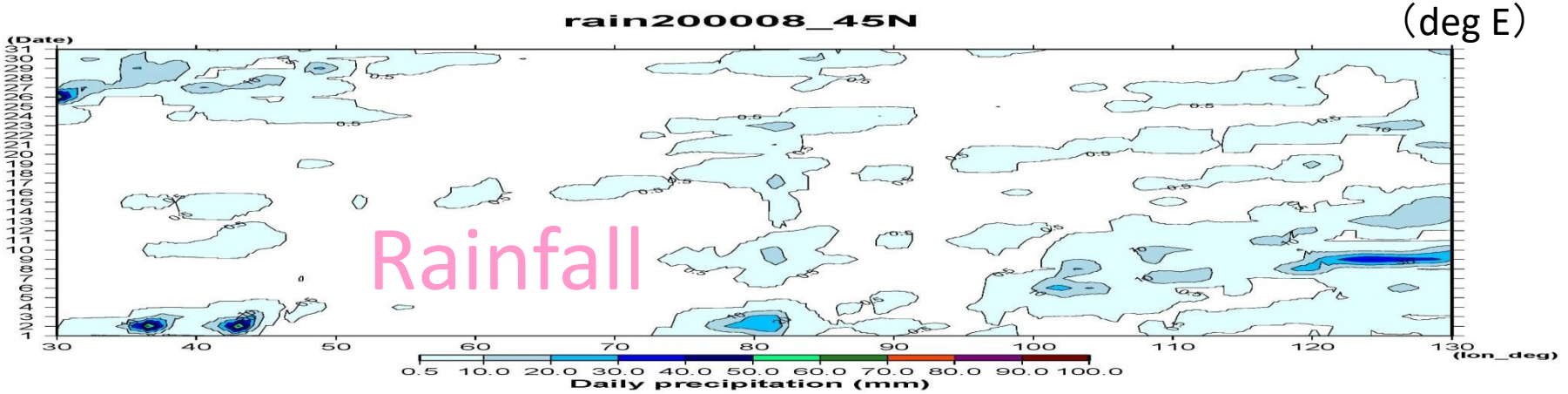
. Comparing rainfall amount and low pressure along 45°N

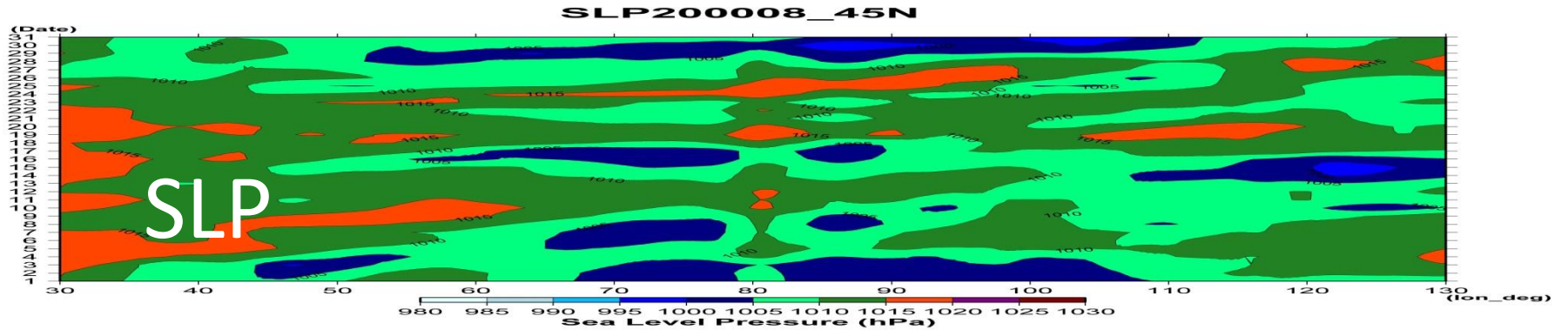


Aug., 2000

6.Rainfall amount .vs. topology



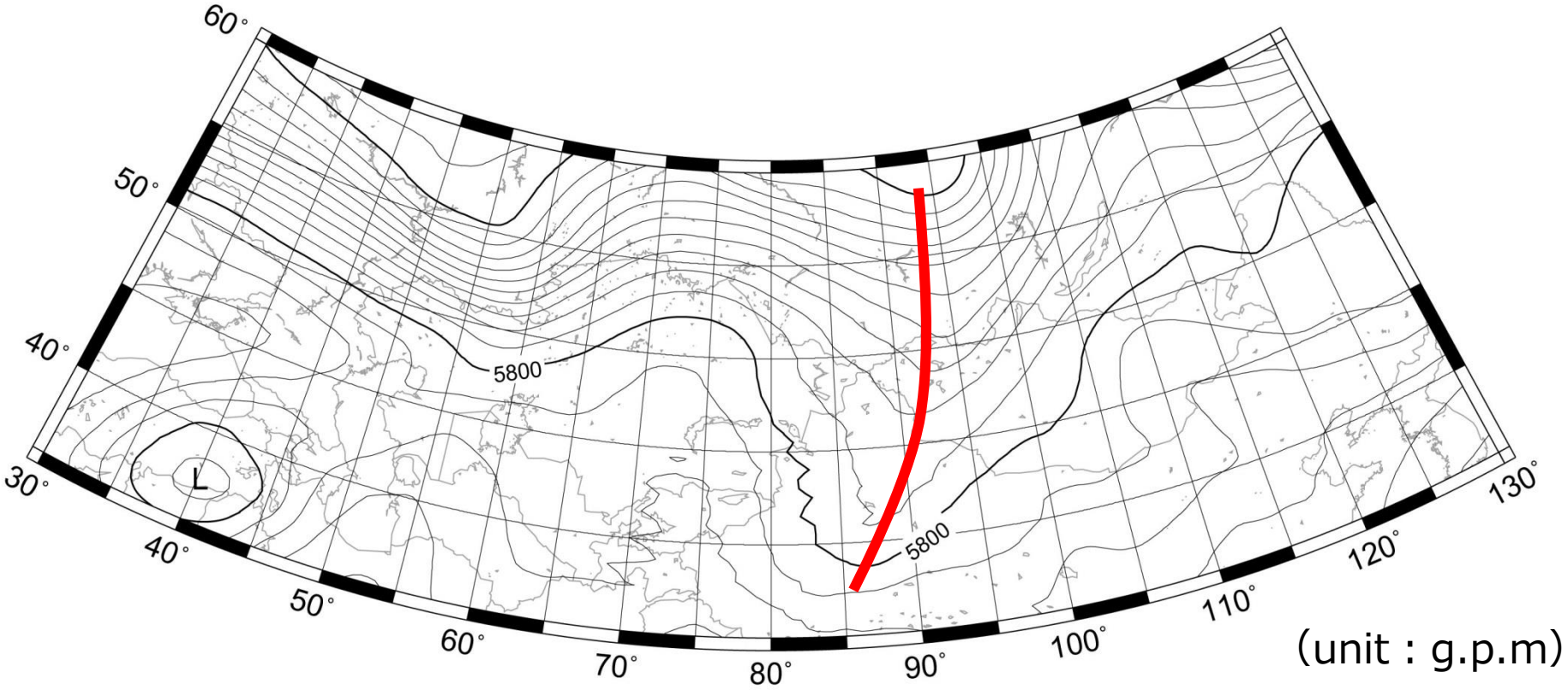




7. Moving speed of low pressure

500hPa height

Aug. 5th, 2000

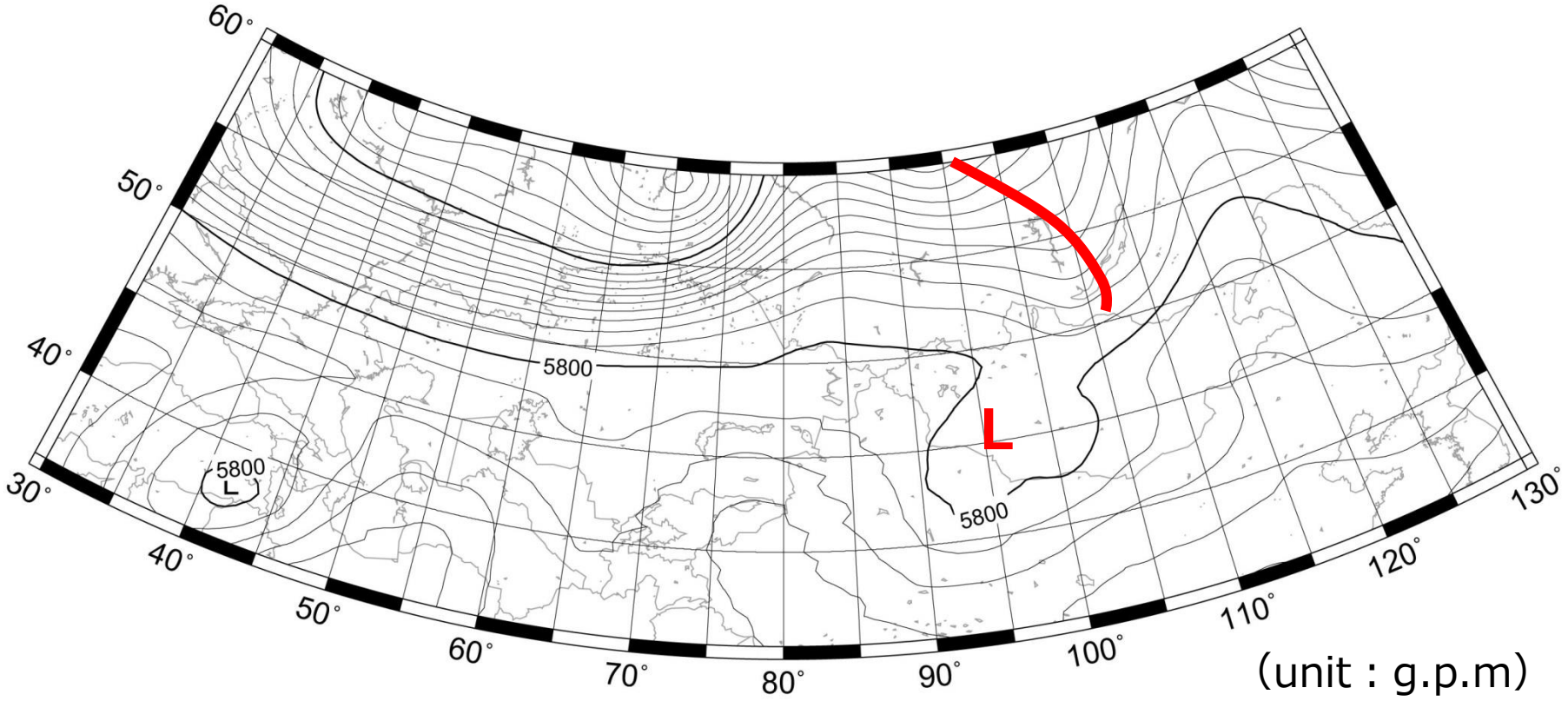


(unit : g.p.m)

Trough moving at 500hPa height

500hPa height

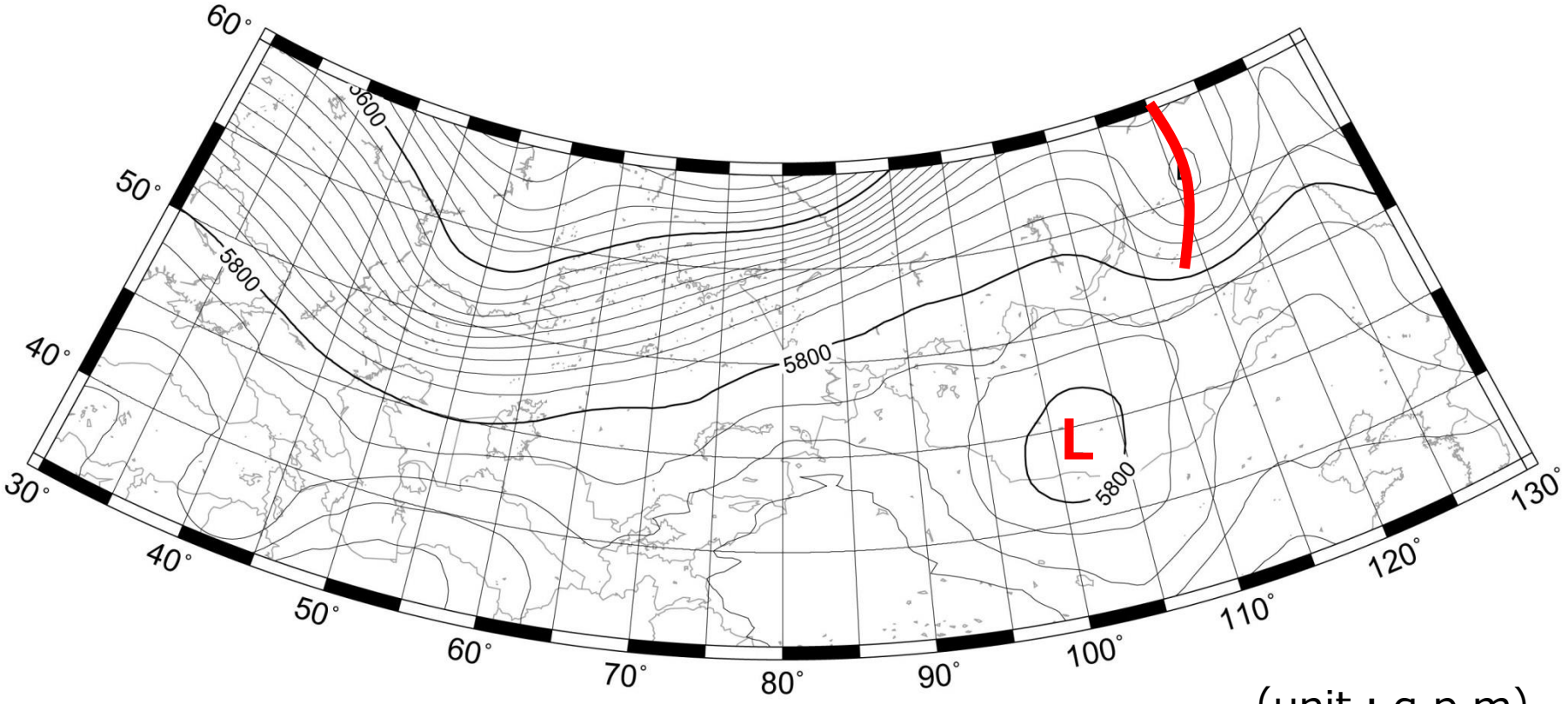
Aug. 6th, 2000



(unit : g.p.m)

500hPa height

Aug. 7th, 2000

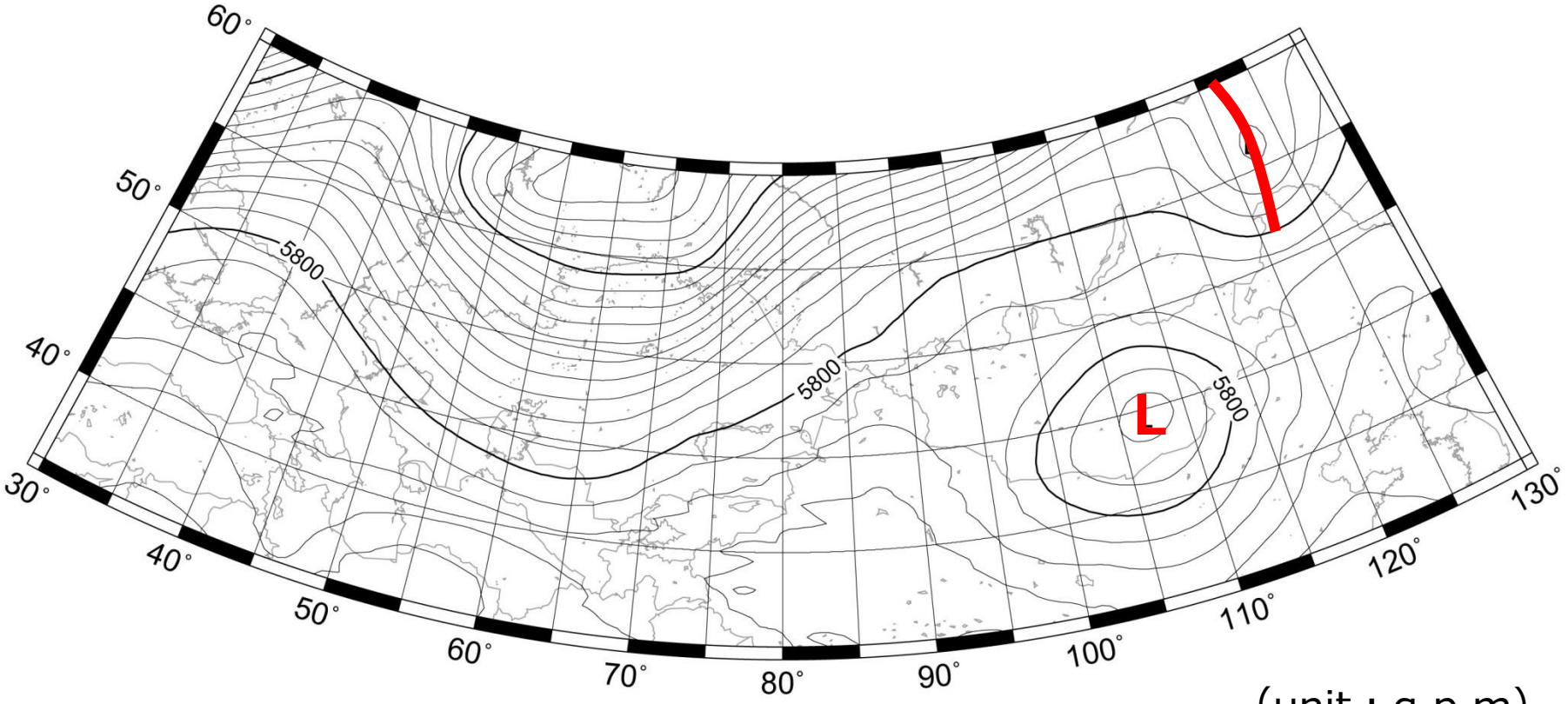


(unit : g.p.m)

Sapareted Low is formed at 500hpa

500hPa height

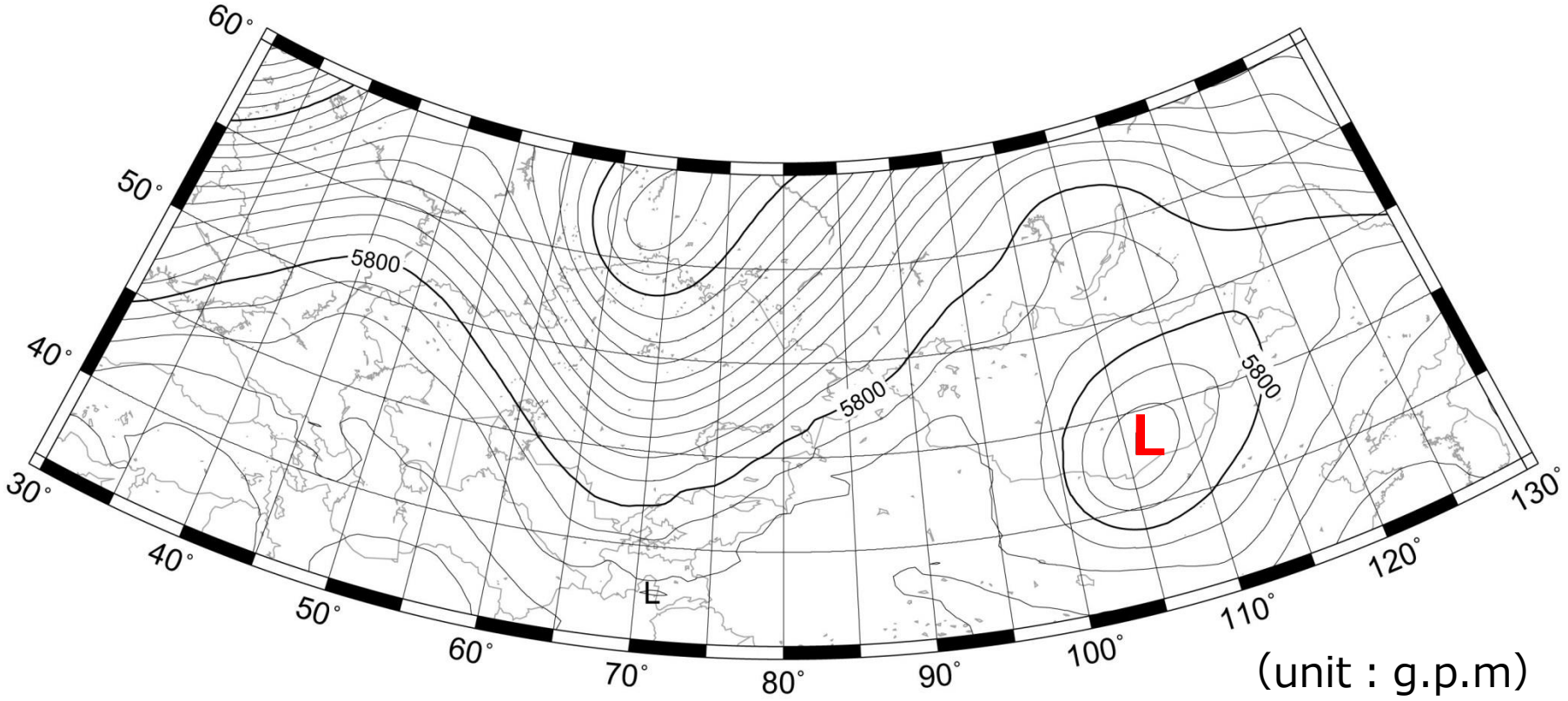
Aug. 8th, 2000



(unit : g.p.m)

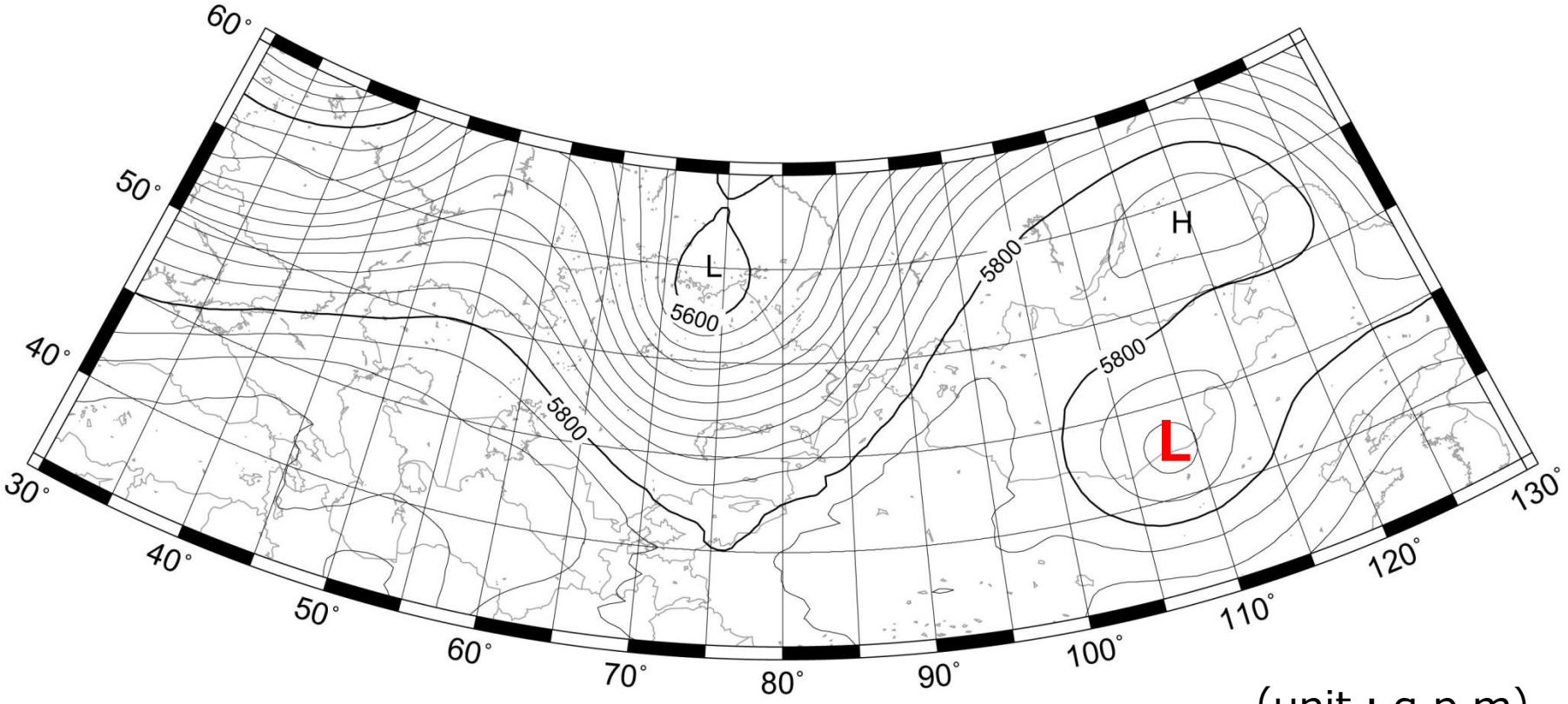
500hPa height

Aug. 9th, 2000



500hPa height

Aug. 10th, 2000



(unit : g.p.m)

LPs with different speed

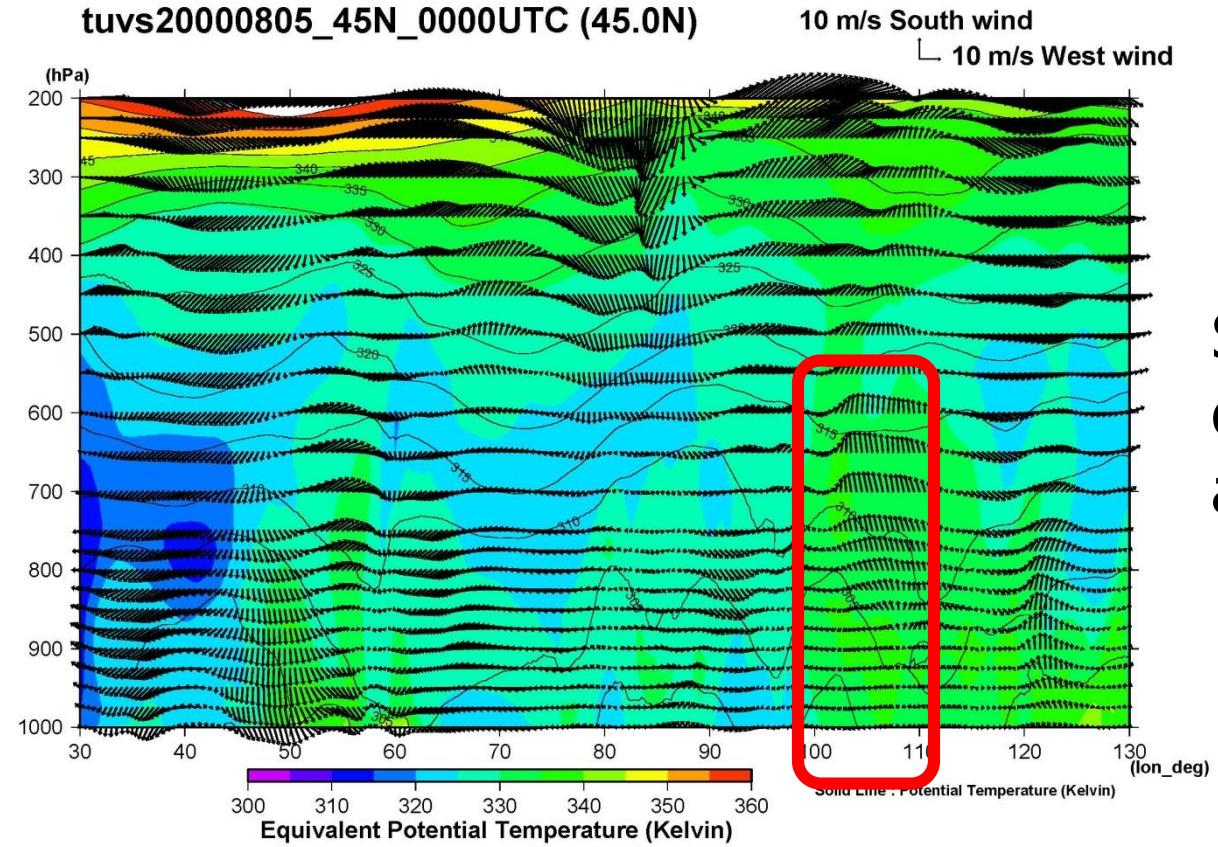
- With 500hPa trough moving,
  - Low speed LP(a few) :
    LP formed by cut-off low along 40-45E
  - Middle speed LP(many):
    Normal trough moving
  - High speed LP(a few):
    Trough only norther than 55°N
    ← After a cut-off low formed along 40-45N,
    then the northern trough moves faster.

8.Difference of LPs' structure between west and east in Eurasian Continent

- In longitude-height section,
  ①potential temperature (θ)
  ②equivalent potential temperature (θe)
  ③horizontal wind
  are analyzed.

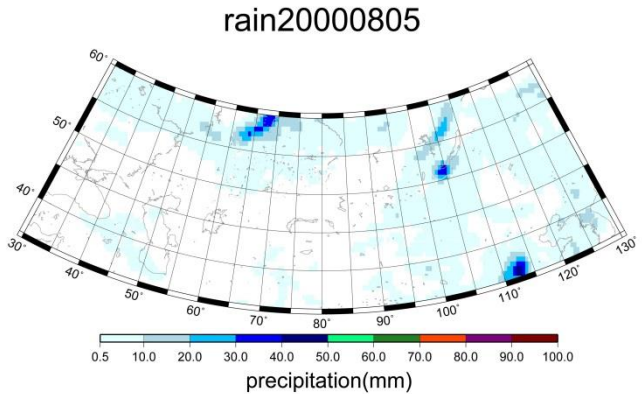
when θ ≒ θe, dry
when θ ＜ θe, wet

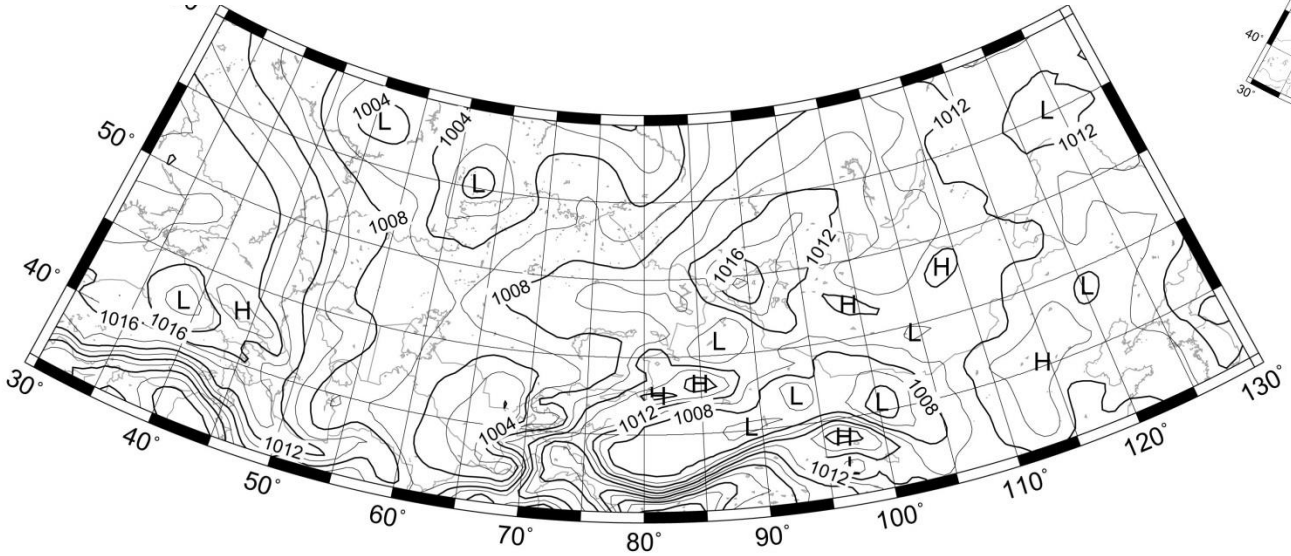
- LP's structure is changed as it moves eastward over the Eurasian Continent.

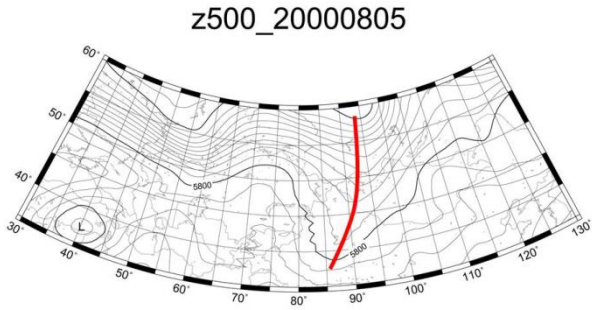


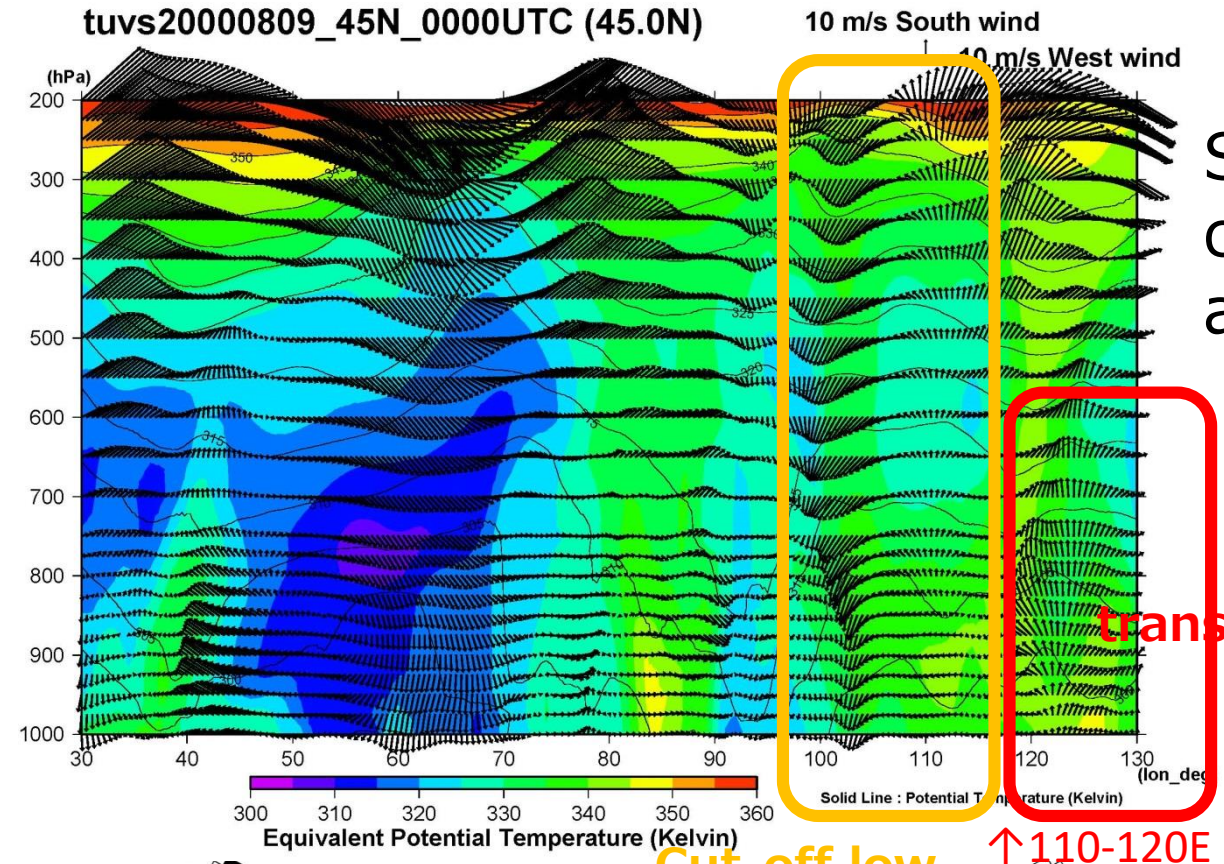
Solid line : θ (K)
color : θe (K)
arrows : horizontal wind

Rainfall by LP in front of trough









Solid line : θ (K)

color : θe (K)

arrows : horizontal wind

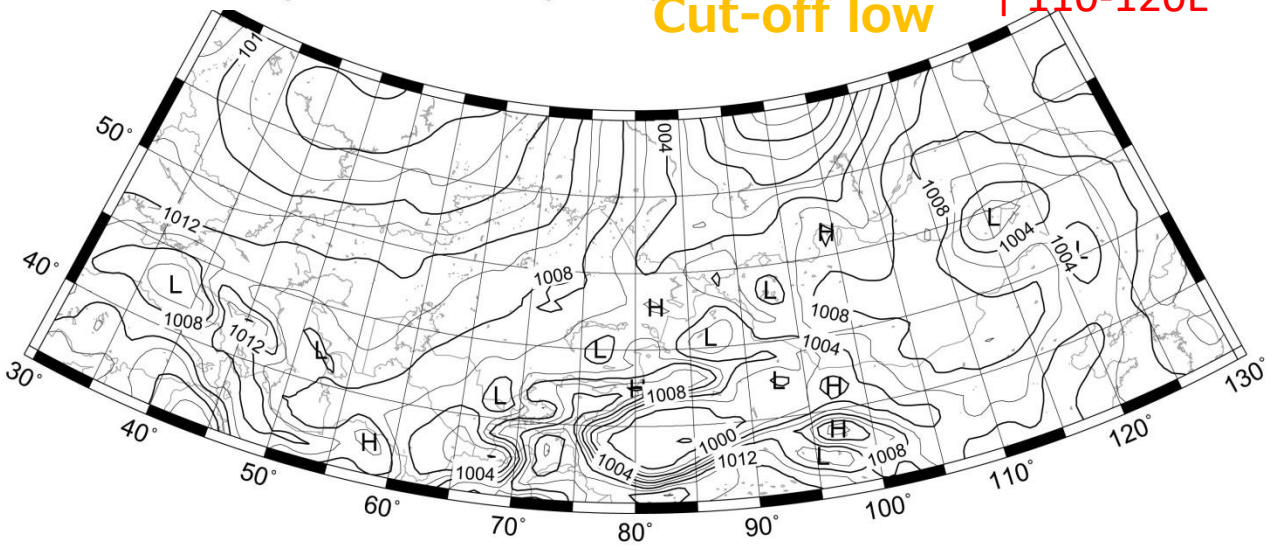
High θe

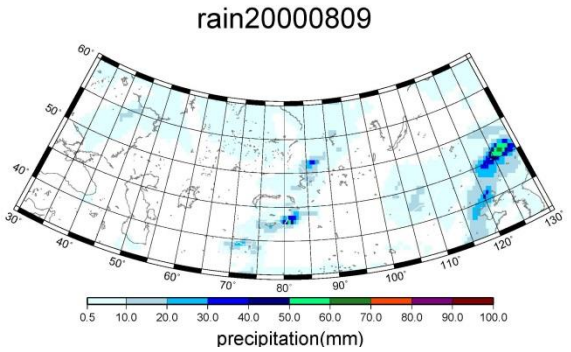
↑

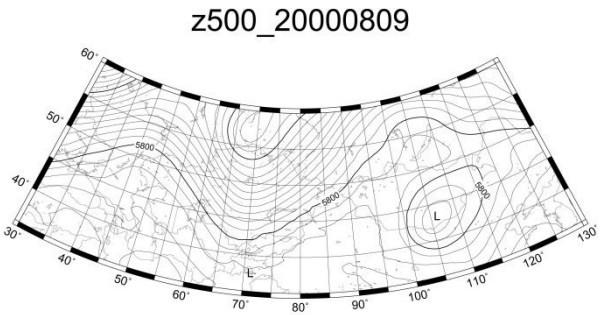
Water vaper is transported from southeast

↑110-120E

Cut-off low







9. Conclusion

Rainfall change around Mongolia in summer

(1) **Rainfall amount .vs. altitude**

Rainfall amount is larger around (45N,80E) because of forced uplift over high altitude.

(2) **Difference of low pressure moving speed**

LP moves by westerly.

But the speed changes when cut-off low is formed.

(3) **Change of low pressures' structure over Eurasian Continent**

LP in front of trough brings rainfall inland.

Water vapor transportation is found from Japan Sea near the eastern coast.