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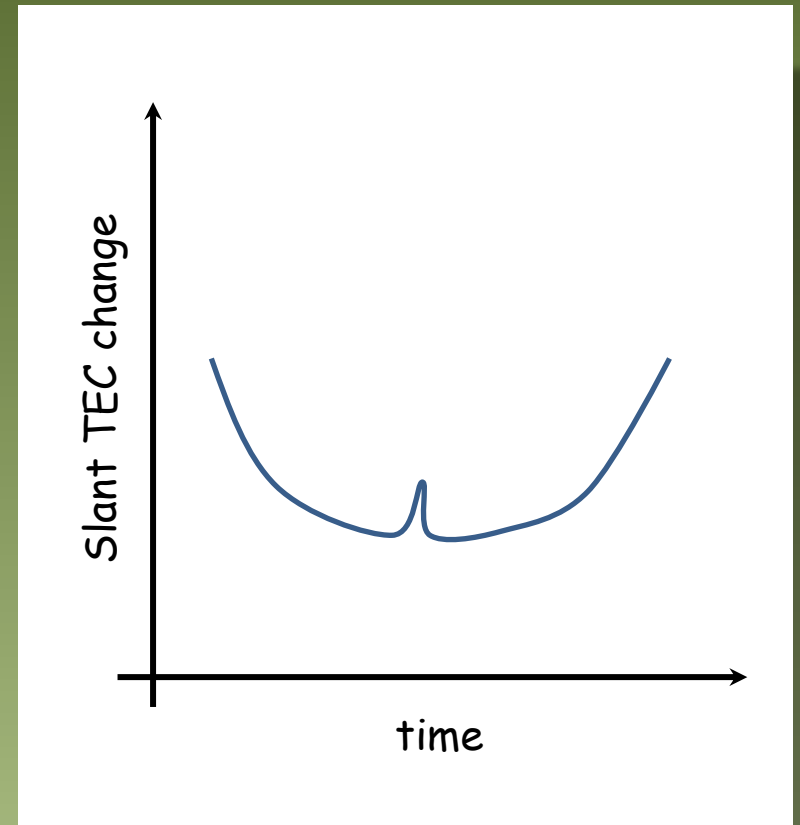
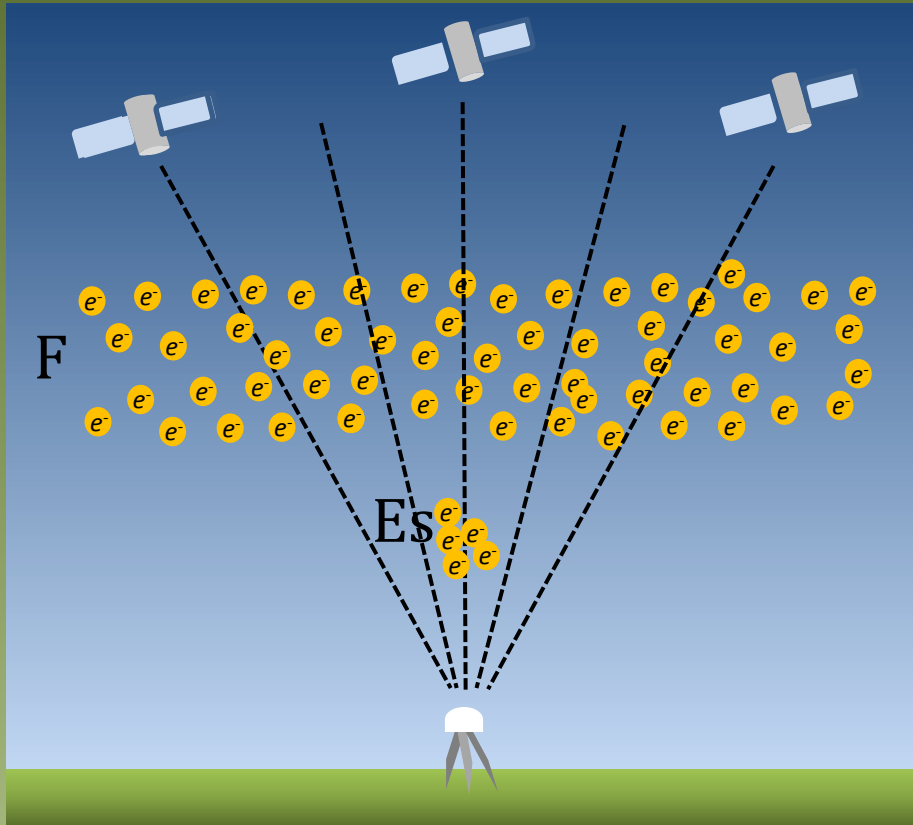


Tidal effect of the neutral atmosphere in the lower thermosphere on the movement of sporadic *E* at midlatitude

*Jun MAEDA, Kosuke HEKI

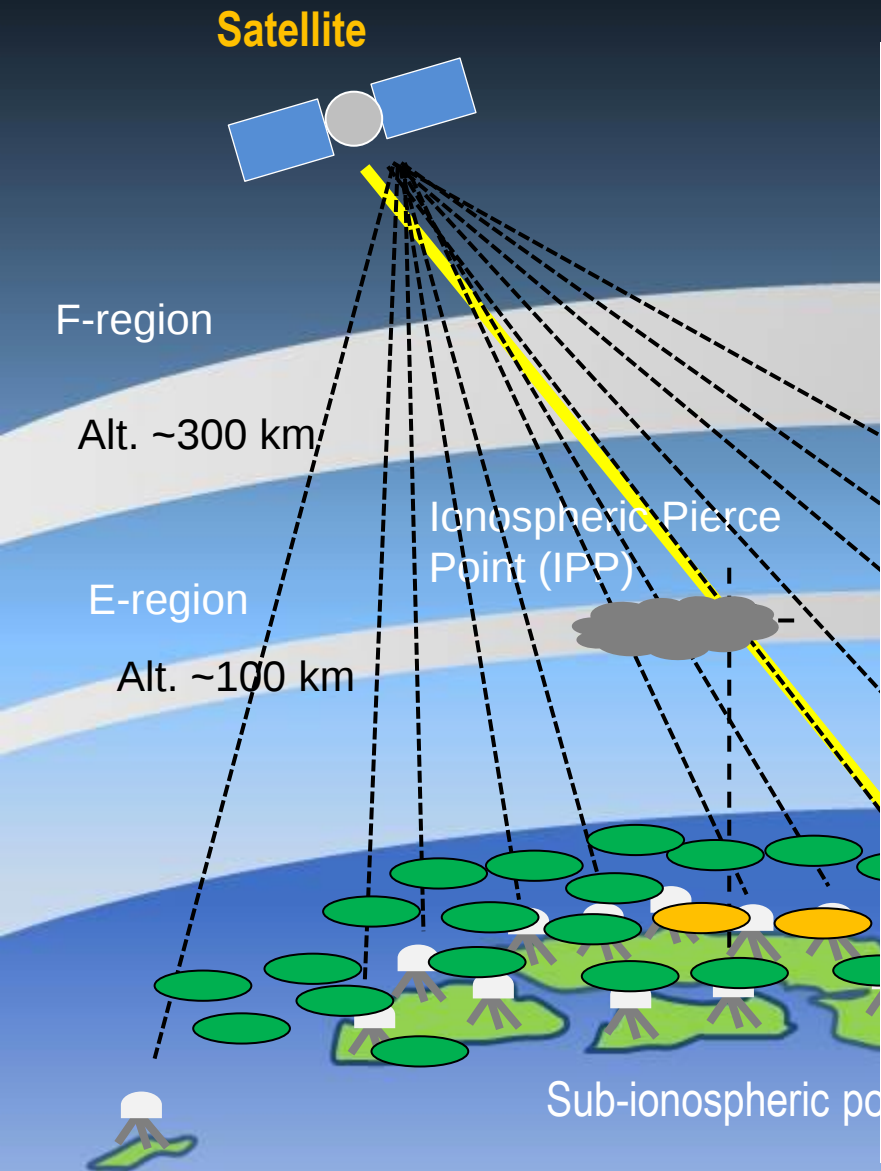
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Method: GPS-TEC observation

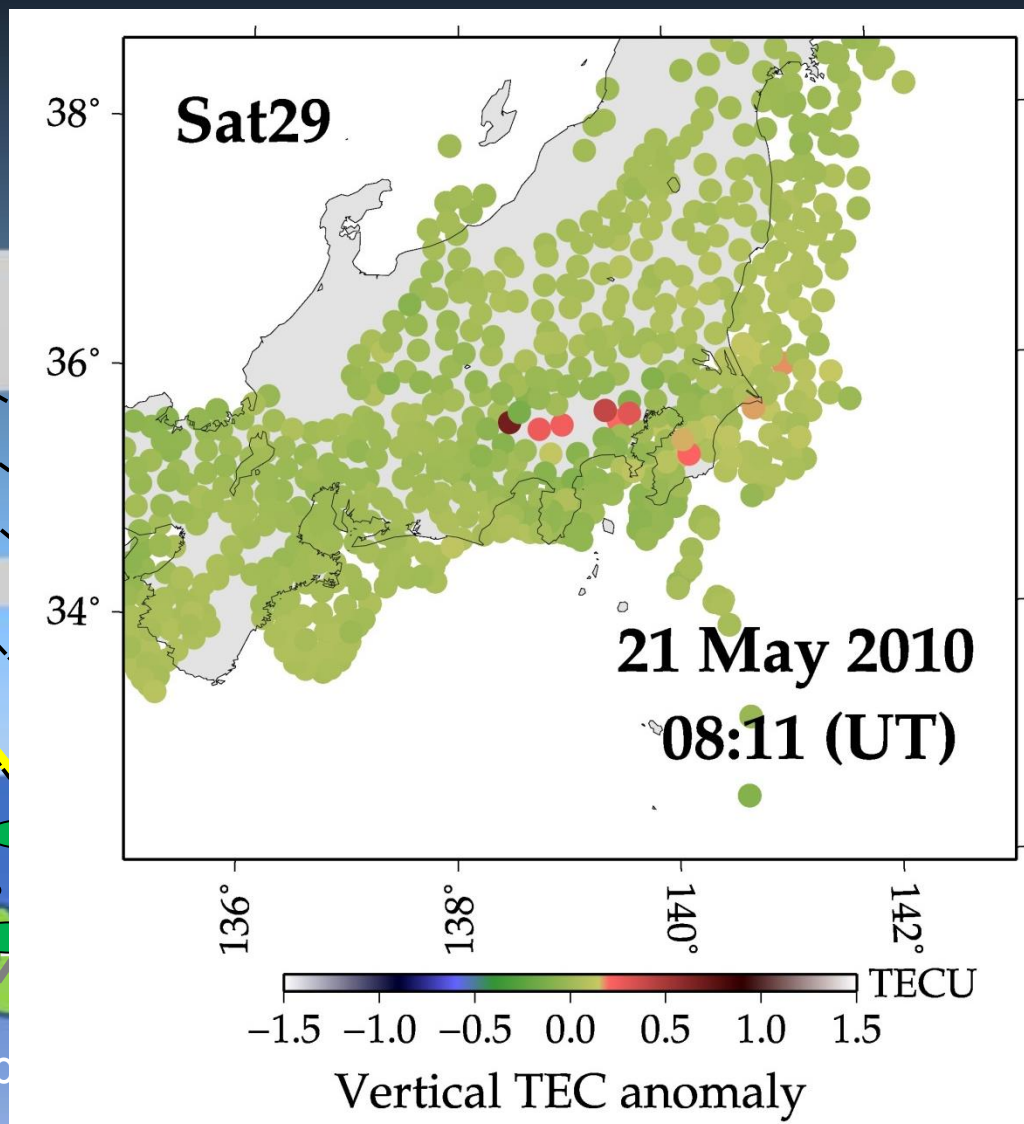


TEC must increase when the line-of-sight penetrates Es.

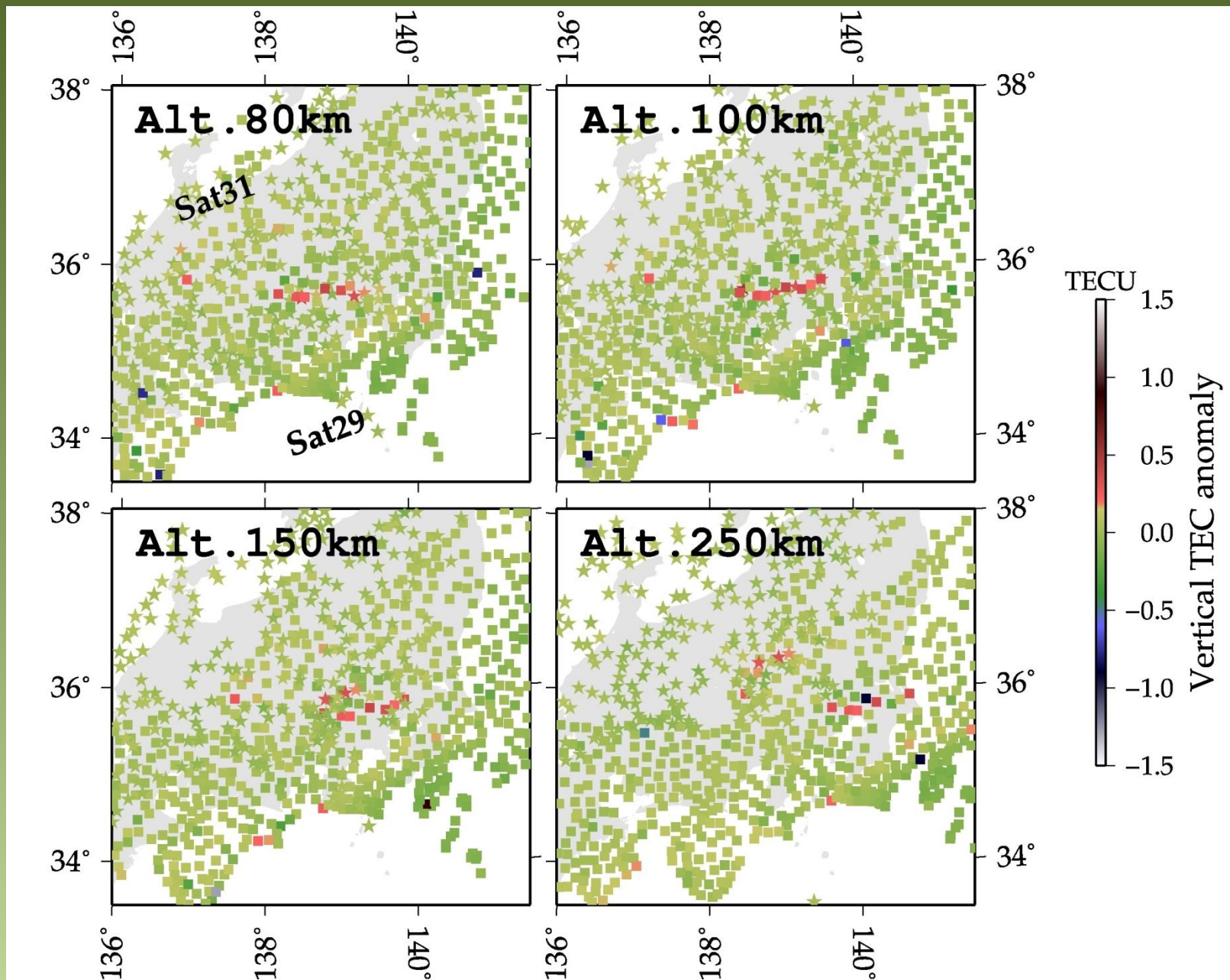
TEC mapping



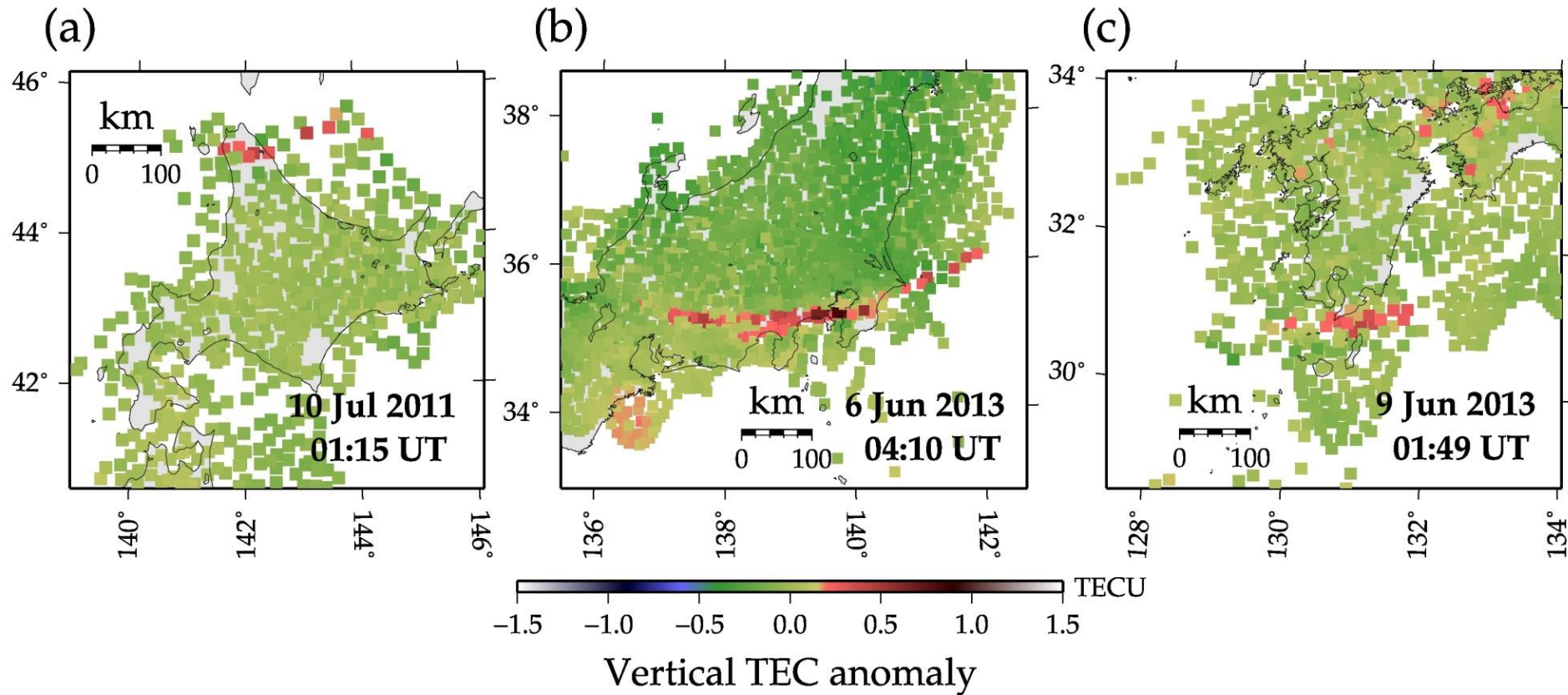
2-D horizontal shape of Es



Height constraint by TEC map

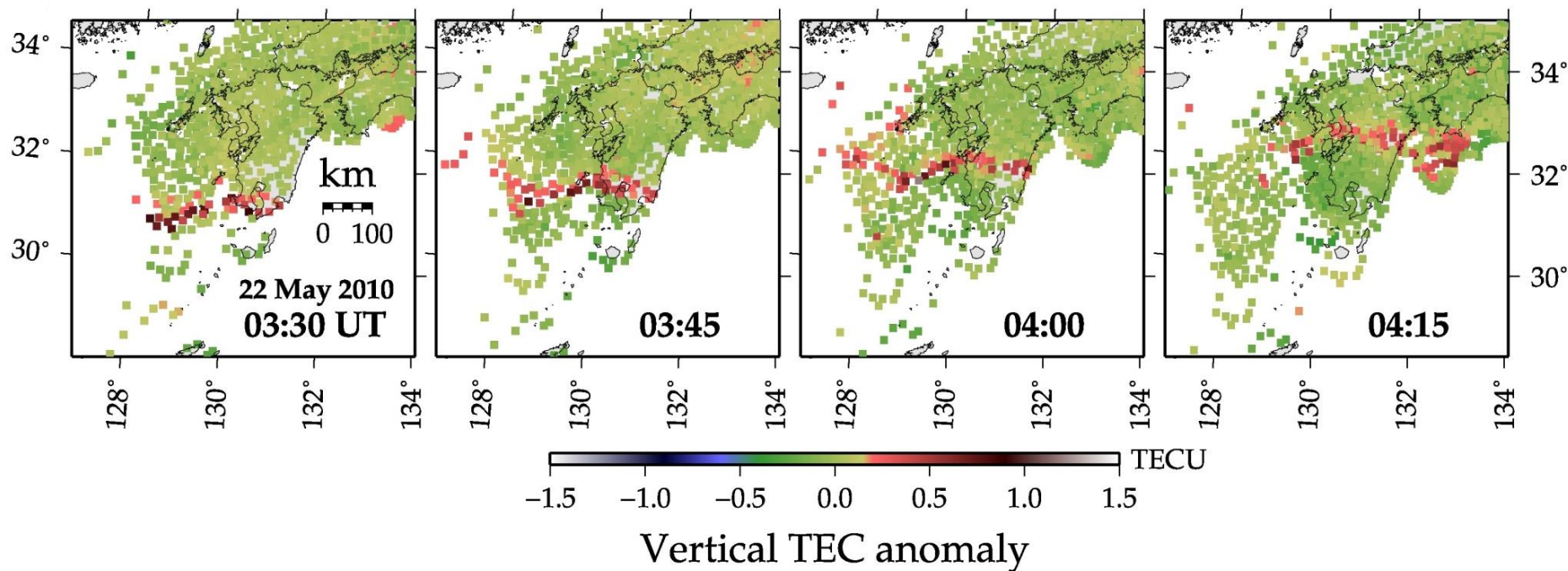


Frontal structure



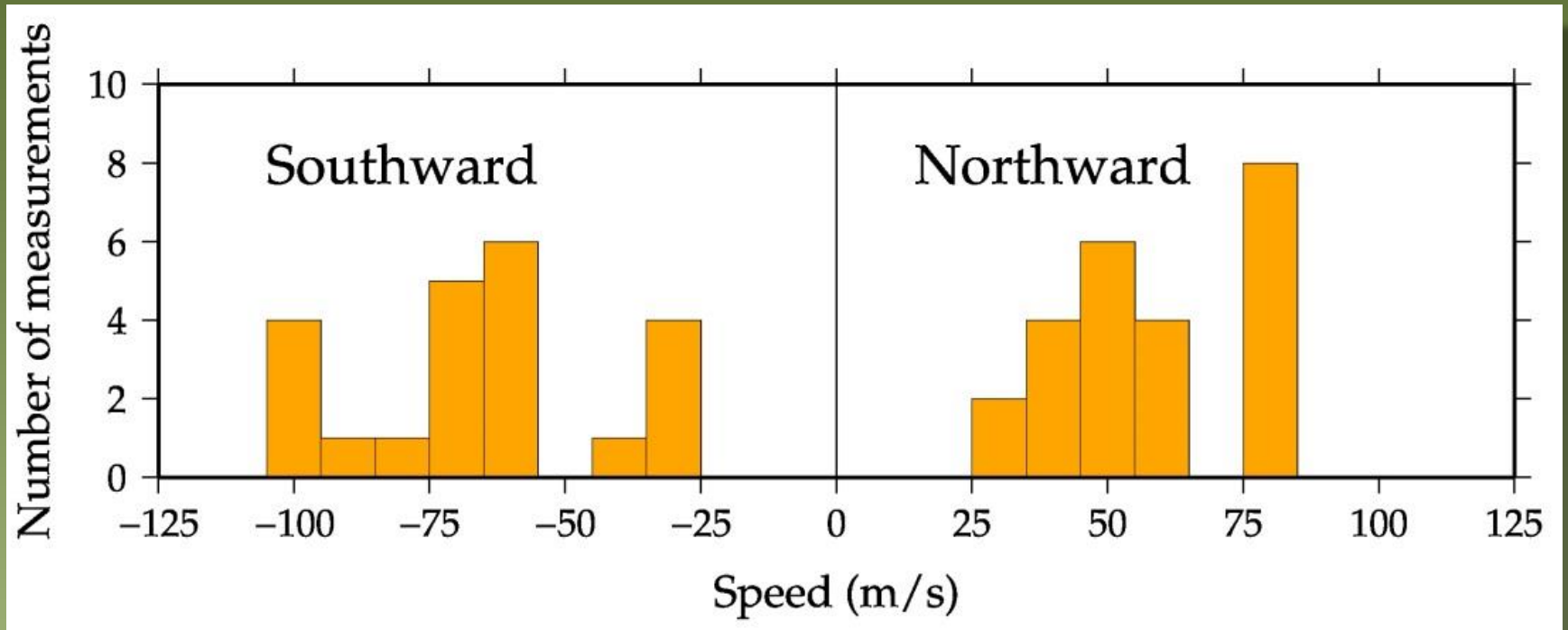
- E-W frontal structure is common at any latitude in 30-45N.
- Lengths often exceed 100 km. Widths are 10-30 km.

Analysis on Es movement



- 24 Es cases in 2010 by 5 min TEC map
- Direction (only in N-S)
- Velocities in 15 min (measured multiple times)

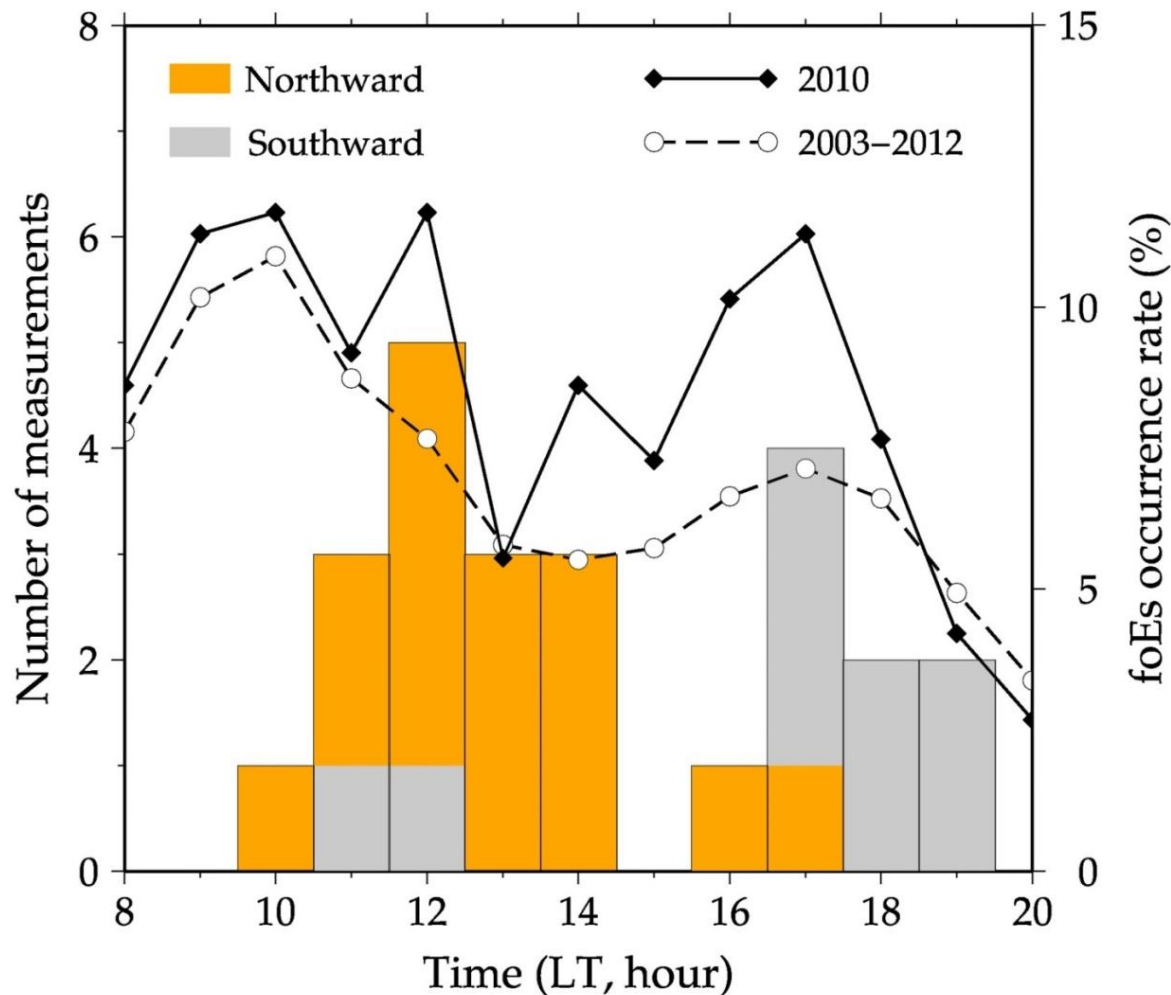
Speed in N-S direction



Average speed: ~60 m/s

Consistent with the speed of neutral winds.

Atmospheric tide & Es movement

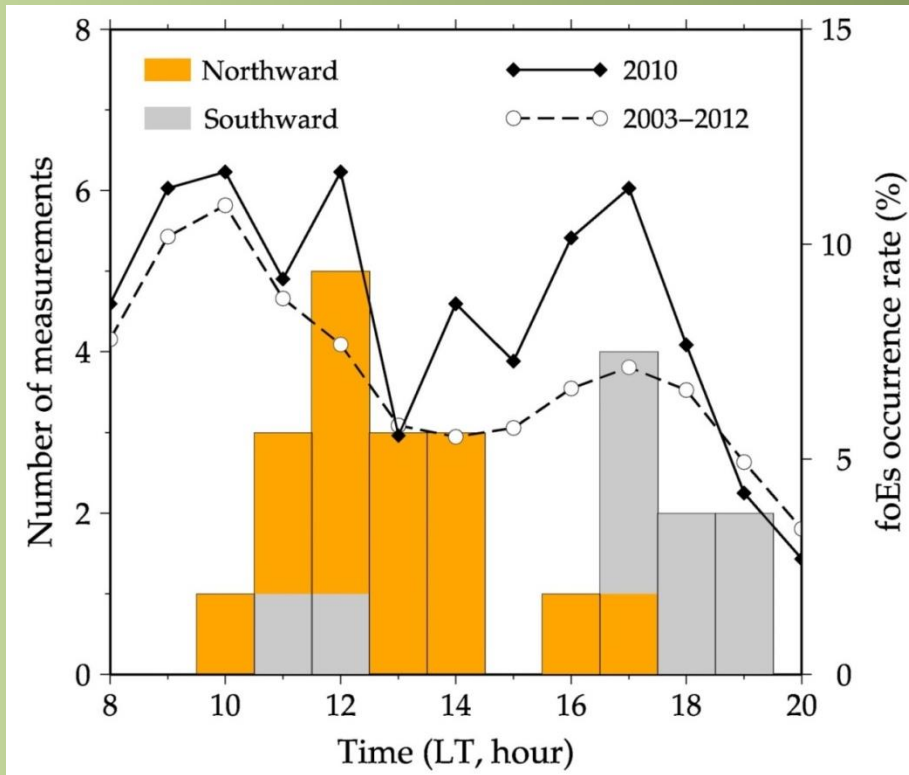


Northward in 10-14 LT
Southward in 17-20 LT

f_oE_s 8 h periodicity
(Haldoupis and Pancheva, 2006)

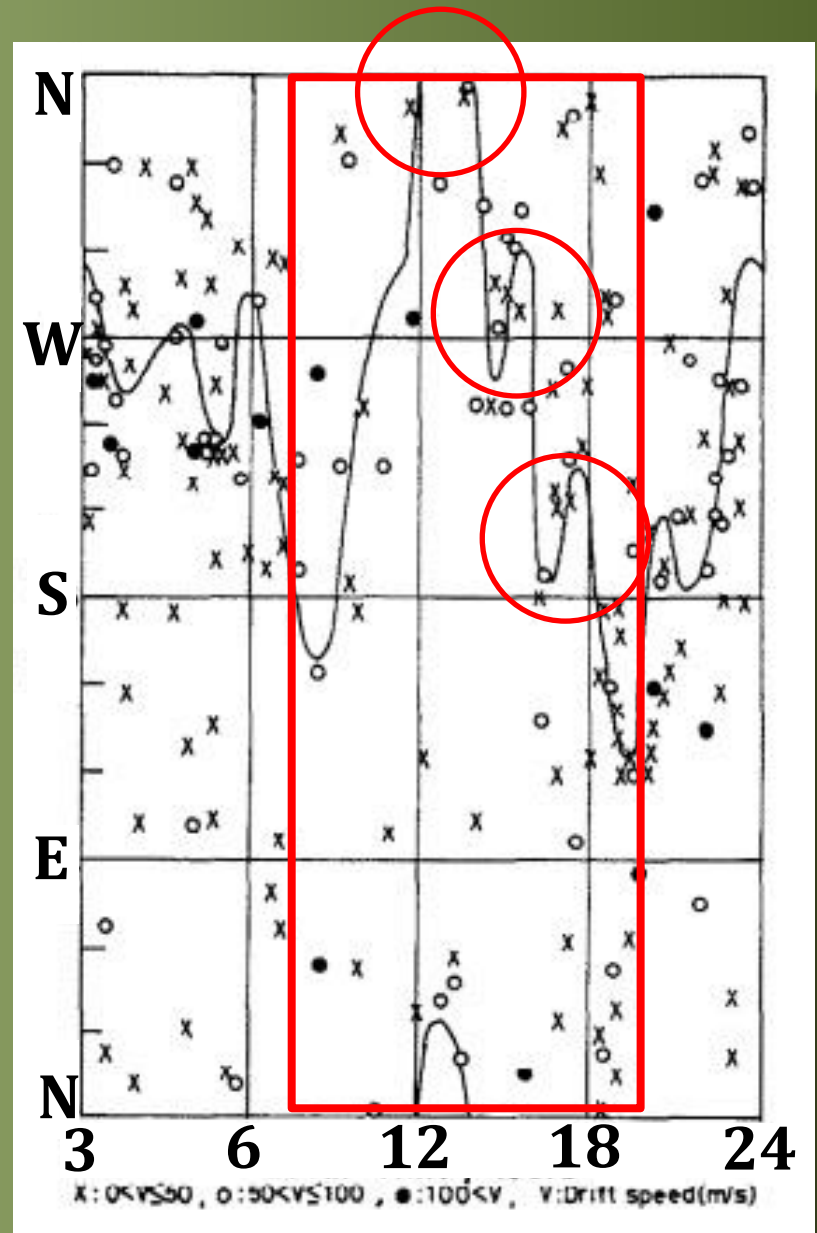
Tidal effect

Discussion



Tides may move

1. whole shear region
2. Es structure



Tanaka [1979]

Conclusions

- Speed of Es movements are likely to reflect that of neutral winds.
- Northward and southward movements of Es concentrate in ~12 LT and ~17 LT, respectively.
- Silent period at 15 LT implies the rotation of movement directions, i.e., towards east or west.
- Global atmospheric tide may control the direction of Es movement.