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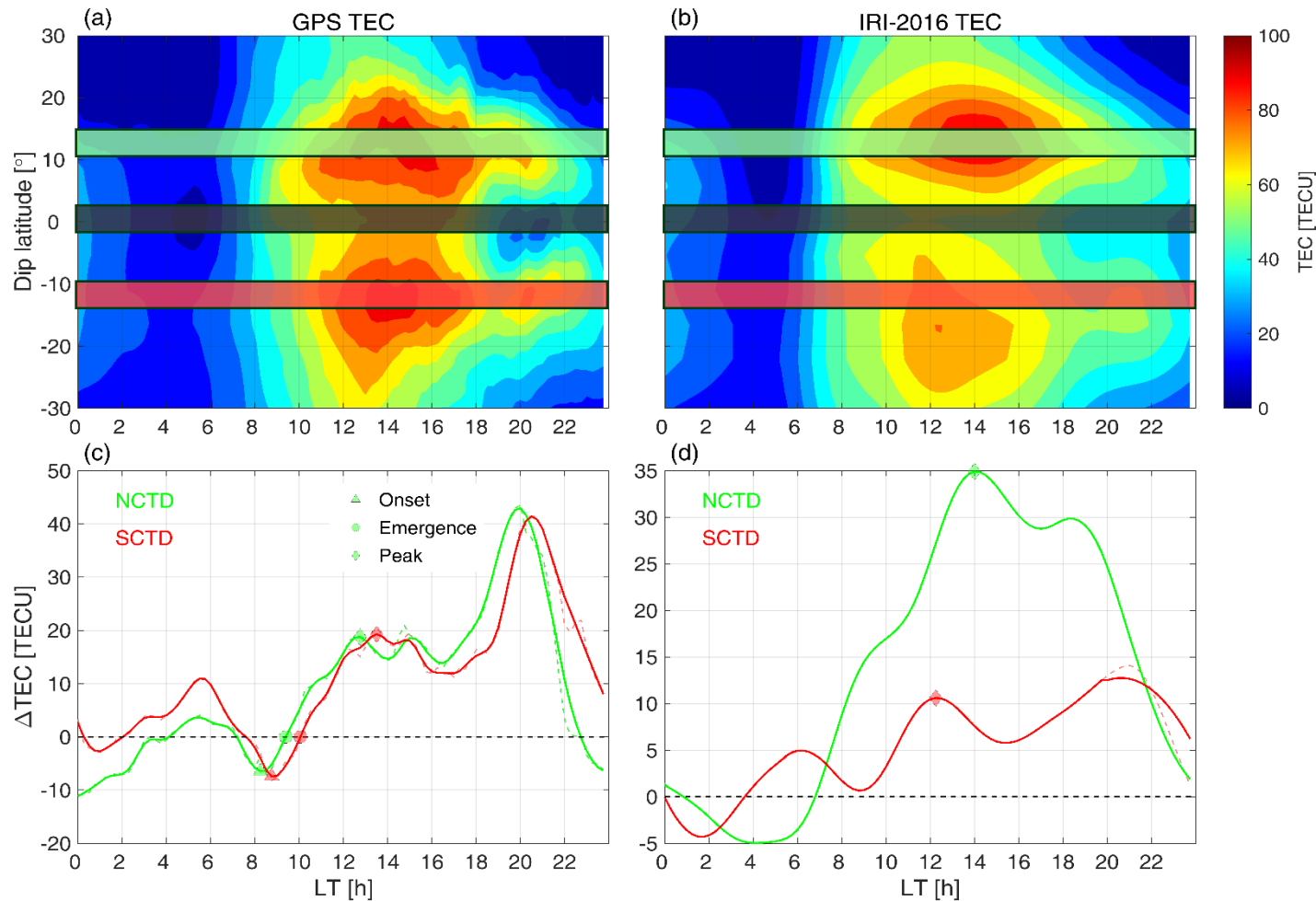
Annual and semi-annual cycle of the EIA diurnal evolution: assessed by IGS-TEC and IRI-2016 TEC over Indian and Peruvian sectors

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Crest-to-trough difference

20131101 Indian sector@75° E



Equator $\sim [-2.5^\circ 2.5^\circ]$ \sim EIA trough

Off-equator $\sim \pm [10^\circ 15^\circ]$ \sim EIA crest

$$\text{CTD} = \text{TEC}_{\text{off-equator}} - \text{TEC}_{\text{equator}}$$

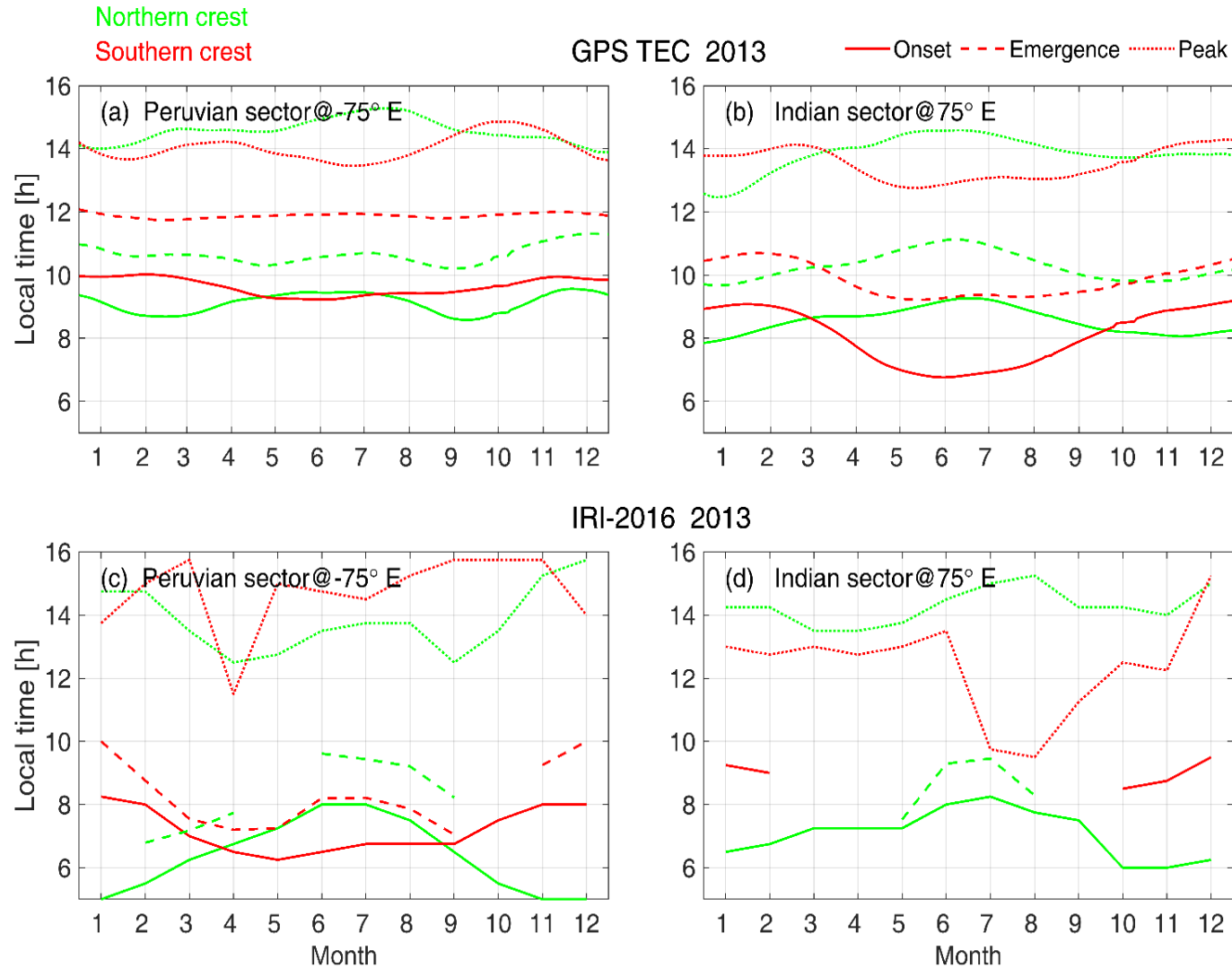
During the development of EIA, CTD characterize the competition of the plasma accumulation between the crest and trough.

The EIA **onset**, **first emergence**, and the **peak** can be determined.

Annual variation

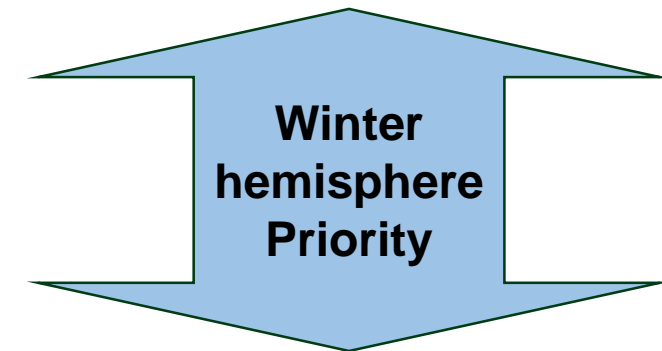


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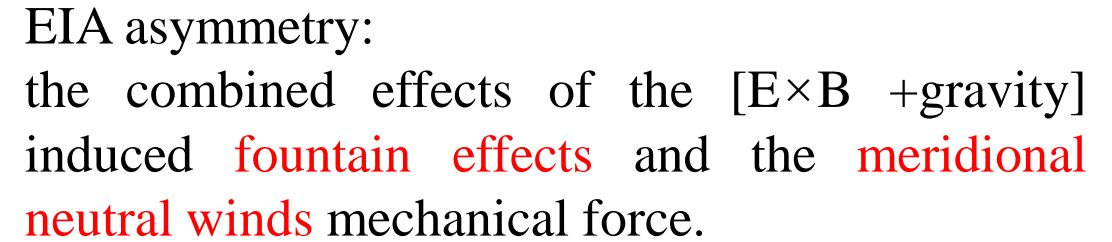


Peruvian sector: Semi-annual cycle
EIA northern/southern crest develops earlier during two equinoxes

Indian sector: Annual cycle
EIA winter crest develops earlier



For both sectors
EIA winter crest develops earlier



This scenario explains the annual cycle

Meridional neutral wind would also cause the uplifting/lowering of the ionosphere and modulate TEC due to the change of the **recombination**.

In terms of TEC monitoring, this might be the cause of the semi-annual cycle in Peruvian sector.

Still unresolved question: Why Peruvian sector?

Roles of $E \times B$, meridional neutral winds, F region height



Thanks!

Wan, X.; Zhong, J.; Xiong, C.; Wang, H.; Liu, Y.; Li, Q.; Kuai, J.; Cui, J. (2022). Seasonal and Interhemispheric Effects on the Diurnal Evolution of EIA: Assessed by IGS TEC and IRI-2016 over Peruvian and Indian Sectors. *Remote Sens.*, 14, 107. <https://doi.org/10.3390/rs14010107>

