



Interconnection of transitional low to mid latitude ionization density characteristics with spread F from Eastern Mediterranean Longitude sector

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Characterization of the ionosphere in the transition region from the low to the mid latitudes is important in view of recent findings of coupling between the two regions. Steeper gradient of ionization on the poleward side of the Equatorial ionization anomaly (EIA) in the Indian longitude sector was reported by *Rastogi and Klobuchar* [1990]. Correlation of this steeper gradient of ionization with occurrence of post sunset ionospheric scintillations around the northern crest of EIA was established by *Das et al.* [2014]. *Paul et al.* [2015] illustrated cases of post midnight GPS L band scintillations from the transition latitudes in the Indian longitude sector.

In the present paper, efforts have been made to understand the ionospheric coupling mechanism between the steeper gradients of ionizations and corresponding occurrence of spread F observed from a chain of stations in the transitional midlatitude region over the Eastern Mediterranean longitude sector. *Paul et al.* [2018] reports several cases of spread F from mid latitude stations mainly during summer solstice. Accordingly in the present study GPS TEC and S_4 from a chain of stations located at Nicosia, Cyprus (Lat: 35.15°N, Lon: 33.39°E geographic; 51.07°N magnetic dip), Haifa, Israel (Lat: 32.77°N, Lon: 35.02°E geographic; 48.02°N magnetic dip), Jerusalem, Israel (Lat: 31.59°N, Lon: 35.39°E geographic; 44.79°N magnetic dip) and Ramen, Israel (Lat: 30.59°N, Lon: 34.76°E geographic; 35.14°N magnetic dip), situated along the longitude swath of 33°-35°E have been analyzed during the period of March-April 2011 and May-August 2014. The latitudinal gradients of TEC have been calculated for the magnetically quiet days using an elevation mask of 40° during 10:30 – 16:30 LT. Several co authors have observed the occurrences of spread F from both low and mid latitudes and tried to find different mechanisms that responsible to develop irregularity structures from ionosonde. *Tsunoda* [2009] reported isodensity contour patterns at the bottom of F layer which may predict the irregularity initiations at the F layer called multiple reflected echoes (MREs). *Joshi* [2016] has related these patterns with the ionization density from Indian longitude sector. MREs can act as precursor to the spread F, so efforts have been made to correlate the TEC gradient with the occurrence of spread F from Nicosia. In order to corroborate the findings of *Tsunoda* [2009] and *Joshi* [2016] in the eastern Mediterranean longitudes, ionosonde data from Nicosia, an mid latitude station was used during local post sunset to midnight hours. Strong correlation was observed between the latitudinal gradient of TEC and GPS S_4 and spread F observations from Nicosia. These results may indicate a possible interconnection between day time ionization density variations and post sunset ionospheric irregularity development from the relatively less explored transitional low to mid latitude in the eastern Mediterranean longitude sector.

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