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On the problem of GNSS observation coverage for the IGS ROTI maps for the Southern hemisphere

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The Earth's ionosphere responses to Space Weather with the global redistribution of plasma density, creates favorable conditions for generation of ionospheric plasma irregularities and gradients. The storm-induced ionospheric irregularities are responsible for radiowaves scintillation and can seriously affect satellite-to-earth radio signals propagation. The International GNSS Service (IGS) diurnal ROTI maps ionospheric product was initially developed to characterize ionospheric irregularities over the Northern Hemisphere using ground-based GPS observations. This ROTI maps demonstrated good performance to monitor occurrence and intensity of high and mid-latitude ionospheric irregularities at this region. Recently, we introduced new experimental IGS ROTI maps that can cover additionally area of the Southern hemisphere and low latitude regions. The main problem toward this task is that existing GPS observations are distributed non-uniformly around the globe. Major part of GPS stations operates in the Northern hemisphere. In the equatorial region, there are available GPS observations from ~400 stations, for the Southern hemisphere's middle/high latitudes, we have only ~150 GPS stations providing regular observations, and these stations locate mostly in South America. With modification of basic IGS ROTI mapping approach, we can create diurnal ROTI maps for the Southern hemisphere and equatorial regions even on this limited dataset. However, further extension of GPS networks in South America is of crucial importance. We analyzed performance of new ROTI maps to represent well-known features of storm-time ionospheric irregularities development over Southern hemisphere's high/mid latitudes and comparison with the Northern hemisphere results. For low latitudes area, we examined sensitivity of resulted maps to detect plasma irregularities associated with equatorial plasma bubbles in South America. The IGS ROTI Maps with the global coverage are important for further studies of ionospheric irregularities' occurrence and spatial distribution and assessment of the Earth's ionosphere responses to Space Weather events of different intensity during new solar activity cycle.