Post collision tectonics and its impacts over the geohazards of the Peninsular India

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Abstract

The Triangular land mass falling south of Kutch (West coast)-Ganges delta (east coast) and up to Cape Comorin in the southern tip of India, namely the Peninsular India, has been historically considered as a 'Stable Continental Region (SCR)' and free from recent earth movements and seismicity, until recent times when more inferences have started coming out on the Quaternary earth movements. These inferences were mostly the post Mesozoic land rejuvenations and the tectonic uplift of Nilgiris and the other mountains of the Western Ghats, tectonic arching and deepening , reactivations of ancient faults related to intraplate stresses, migrations of the river systems and the related drainage anomalies, coastal zone tectonics and the landforms related to the land- ocean interactive dynamics and also the low to moderate earth tremors in different parts of the Indian Peninsular . In this connection, the comprehensive post collision tectonic model was developed by the author of this article(Ramasamy, 2006) on the basis of remote sensing derived hierarchy of tectonic, Tectonic geomorphic, fluvial and coastal geomorphic anomalies and the gravity anomalies. In this model he demonstrated a series of alternative East-West cymatogenic arches and deeps(A-J,Fig.1) , N-S extensional(1), NE-SW sinistral(2) , NW-SE dextral(3) and E-W release/distension fractures from Cape Comorin in the south to the Himalayas in the north (Fig.1).Further , he attributed such post collision tectonic model to the still active northerly compressive force related to the northerly drifting of the Indian Plate , its collision with Eurasian plate and the resultant rise of the mighty Himalayan mountains.

Further he named these tectonic features, from the south to the north, as Kollam-Tuticorin Cymatogenic deep(A), Cochin–Rameswaram Cymatogenic arch(B), Ponnani-Manamelkudi Cymatogenic deep(C), Mangalore-Chennai Cymatogenic arch(D), Gokarna-Pennar / Ongole Cymatogenic deep(E), Belgaum –Kakinada Cymatogenic Arch(F), Bombay-

Berhampur cymatogenic deep(G), Saurashtra-Son cymatogenic arch(H), Indo-Gangetic Cymatogenic deep (I)and Himalayas/Himalayan arch(J)(Fig.1).

In this connection, this article has brought out the impacts of such post collision tectonics over the geohazards of the peninsular India from Cape Comorin in the south to Saurashtra-SON in the north.

While the western segment of the Kollam-Tuticorin cymatogenic deep (A,Fig.1) shows evidences of seismicity and tectonic subsidence causing subsidence of buildings and the wells called as 'suicidal wells' and shrinkage and environmental degradation of islands like Munroe in Kollam coastal area, the central segment is represented by the significant tectonic gap in the Western Ghats(Tenkasi gap) displaying high degree of fracturing and micro seismicity and the eastern part of the cymatogenic deep shows evidences of ongoing land subsidence , uniform wider flood plain , the haphazard floods and the highly wandered Tamirabarani river in the area of confluence with the Bay of Bengal. Occasional seismicity and frequent storm surges are also witnessed in Tiruchendur part of this deep-A. Whereas ,the Cochin -Rameswaram cymatogenic arch (B,Fig.1)is reflected in the form of historical uplift as apart of the 'Pleistocene-Mid Holocene uplift of the southern sedimentary Basin , the recently measured to the tune of 0-10 mm/yr , convexity with bundles of beach ridges and the ongoing withdrawal of huge Vembanad lake in Cochin area in the west; extensive gulley and sheet erosion in the central part ; and phenomenal withdrawal of the sea ,development of major lobate deltas at three stages almost from Madurai in the west to Ramanathapuram in the east, ongoing northerly tilting of the Ramanathapuram delta and the related geoenvironmental hazards and the formation of Adam's bridge between Rameswaram and Sri Lanka are the characteristic issues of geoenvironmental hazards along the eastern segment of the Cochin-Rameswaram cymatogenic arch .(iii) similarly all these cymatogenic arches and the deeps do show significant evidences for their control over geohazards in the Peninsular India such as :-

a. The Ponnani-Manamelkudi deep (C, Fig.1) showing multiple lineaments and geomorphic evidences of neotectonics in Ponnani area in the west and the major Palghat gap with the evidences of neo tectonics and the geophysical signatures indicating evidences of ongoing grabenning along in the centre and preferential migration Vellar river in Manamelkudi region in the east,

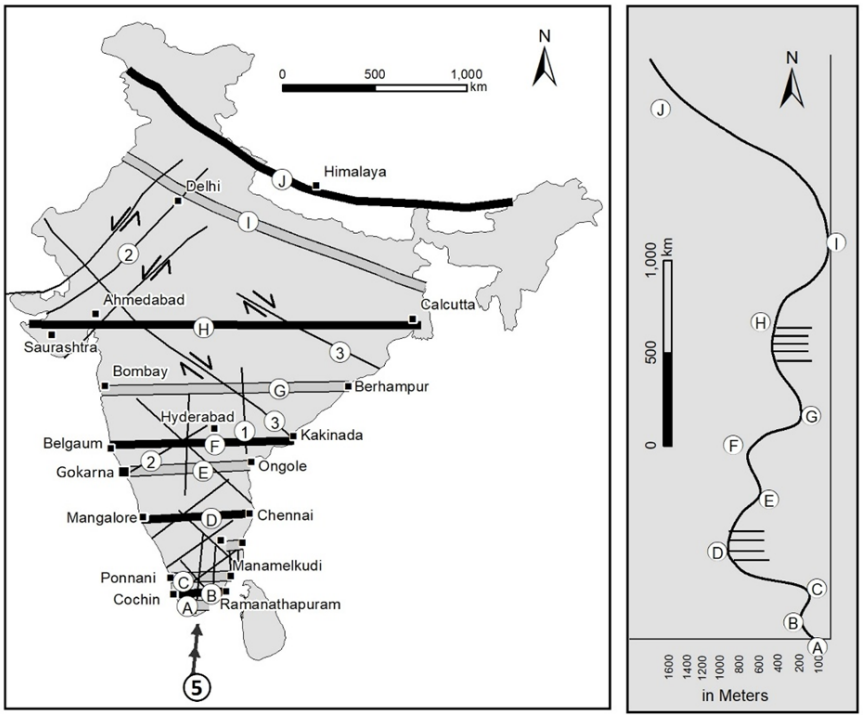

Fig. 1 Post collision tectonics of the Indian plate-*C-arches and deeps* - (A) Kollam-Tuticorin C-deep, (B) Cochin–Rameswaram C-arch, (C) Ponnani-Manamelkudi C-deep, (D) Mangalore-Chennai C-arch, (E) Gokarna- Pennar / Ongole C-deep, (F) Belgaum –Kakinada C-Arch, (G) Bombay-Berhampur C-deep,(H) Saurashtra-Son C-Arch,(I)Indo-Gangetic C-deep and (J)Himalayas/Himalayan arch; ***Faults*** - (1) North-South extension faults, (2) Northeast-southwest sinistral faults,(3) Northwest-Southeast dextral faults and (4) east-west release fracture swarms filled with dykes at places; (5) Northerly directed compressive force.

b. The Mangalore-Chennai cymatogenic arch (D,Fig.1) displaying intraplate stress related tectonic movements, raised beaches in Mangalore and Dhakshina Karnataka and Kudagu region showing their seismic vulnerability to Zone -III in Mangalore area in the west, clusters of micro seismicity in Bangalore region in the centre and the phenomenal migratory history and the land ocean-interactive dynamics and the related geohazards in Chennai region in the east,
c. The Gokarna- Ongole deep (E, Fig.1) with tectonic subsidence and intense storm surges and erosion along Gokarna in the west and active tectonic features, concavity of the coast, the cyclone trapping and the convergence of the tsunami surges along Ongole coast in the east,
d. The Bombay-Berhampur cymatogenic deep(G,Fig.1) which shows continuous warping and localised buckling which stands as a cause for the sediment

slumping in the off shore region , mud diapirs and gas chimneys rising through the sediment layers posing threats to the offshore drilling assets , recurring intraplate seismicity along west coast faults and Panvel flexure in Bombay area in the west , severe drainage congestion and flooding in the central part and cyclone and storm surge inundation in Berhampur region in the east and so on

e. The landslides in the Deccan Volcanic region of Maharashtra /Madhya Pradesh significantly fall along these post collision tectonic featutres

Thus, the geohazards of the Peninsular India , including the Saurashtra -SON(H,Fig.1)are largely controlled by the post collision tectonics

Reference:

Ramasamy,SM. (2006)Remote sensing and active tectonics of South India.International Journal, of Remote sensing,Taylor &Francis Vol. 27,No20:4397-4431

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