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Report

Field trip in the Kerala

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Abstract: This report contains short information about the geomorphological field trip in Kerala State. The field trip was largely focused on various geomorphological and geoecological aspects of laterites and backwaters which dominate in landscape of Kerala. One of the main highlights of the field trip was to the examination of type locality of laterite. Nearly 60% of the Kerala is covered by laterite or laterite-derived materials, and lateritisation process dominates the landform development from the coast to foothills. The second main highlights of the field trip was to the examination of backwaters which are a network of five big lakes (lagoons and estuaries) and rivers linked by natural and man-made canals.

Key words: cliff coast, laterite, Great Indian Escarpment, Western Ghats, Kerala

Before the 9th International Conference on Geomorphology in New Delhi (November 6–11, 2017) organised by the International Association of Geomorphologists and the Indian Institute of Geomorphologists, 13 geomorphologists from 6 nationalities (Poland, China, Italy, Hungary, Brazil, India) had the pleasure to participate in an interesting field trip A2 in Kerala: Laterites and backwaters of Kerala. The six day field trip (October 31 to November 5, 2017) spanned a range of human-environment themes appreciated by participants, while providing exposure to fascinating regional case studies and impressive physical and cultural landscapes of Kerala State located at south-western corner of Indian peninsula (Fig. 1).

The trip was organized and led by Prof. Srikumar Chattopadhyay (formerly of National Centre for Earth Science Studies, Thiruvananthapuram) and M.Sc. Suresh Kumar (his former student). We also had the kind assistance of the guides from Thomas Cook Travel Agency and skill of wonderful driver.

Prof. Srikumar Chattopadhyay started the trip with lectures presenting main features of geology, geomorphology and natural environment of the Kerala as well as outline issues of laterites and backwaters, given in first day in Thiruvananthapuram. The lectures based on long-term studies of Prof. Chattopadhyay and his colleagues geologist Prof. K. Soman.

The field trip was conceived as a two traverse across the entire Kerala State, passing between the Lakshadweep Sea and the Western Ghats range (E–W) and travelling from Thiruvananthapuram to Mangalore (S to N). The field trip was largely focused on various geomorphological and geoecological aspects of laterites and backwaters which dominate in landscape of Kerala:

- latitudinal relief and landscape differentiation in relation to geological structure and rainfall,
- laterites types and lateralisation process and related relief,
- backwaters landscape and ecology in relation to hydrological network,
- longitudinal differentiation of relief – laterites messa, coast cliffs and coastal plains build of recent sediment.

We traversed all major geological formations (Geological Survey of India, 2005):

(i) crystalline rocks of Precambrian,
(ii) sedimentary rocks of Tertiary,
(iii) laterites capping the crystalline and the sedimentary formations, and
(iv) recent and sub-recent sediments forming the low-lying areas, coastal area and river valleys

as well as landforms zones:

(i) the Western Ghats,
(ii) the Coastal Plain and
(iii) the Undulating Lateritic Terrain (ULT) connecting these two units (Chattopadhyay 2017).

At the beginning participants have opportunity to examine relief of the Western Ghats and their foothills, starting from coastal plain 0–50 m a.s.l. and

Fig. 1. Participants of the Kerala Laterites field trip in the Western Ghats top surface

Fig. 2. Participants at the monument of F.H. Buchanan at Angadipuram

crossing lower level of planation surface, the magnificent escarpment of the Western Ghats being the southern segment of the 'Sahyadri' or the Great Indian Escarpment, up high level of planation surface on the ridge around 2000 m a.s.l.

One of the main highlights of the field trip was to the examination of type locality of laterite. Nearly 60% of the Kerala is covered by laterite or laterite-derived materials, and lateritisation process dominates the landform development from the coast to foothills. The term 'Laterite' was coined by Dr. F. H. Buchanan in 1807 as the name of rocks found just in Kerala, what is commemorated at Angadipuram (Fig. 2). Laterite profiles differ due to variability of underling rocks and polycyclic geomorphic surfaces developed at various levels. Participants of the field trips have opportunity to see outcrops of laterites in costal cliffs (the most magnificent is at Varkala – Fig. 3) and cross the lateritic mesas which are conspicuous landforms in Kerala. The messas top surface, built with laterites, at altitude from 100 to 200 m a.s.l. is dissected by up to 100 m deep valleys with relatively steep slopes, and residual hills rise >50 m. Terrain is covered by dense vegetation and forms picturesque landscape. However, removal of vegetation and soils results in development of flat hard crust (duricrust) surfaces being notable features in the lateritic terrain. The very common features of laterite

Fig. 3. Cliff coast at Varkala. The development of cliff is conditioned by subterranean flow of water, resulting in removal of underlying clay materials and accelerated retreat of the cliff face

morphology are 'soup plate', a colluvial-alluvial basins of various shape and size. Laterites are used also for building construction, what caused development of many small quarries (Fig. 4).

The second main highlights of the field trip was to the examination of backwaters which are a network of five big lakes (lagoons and estuaries) and 38 rivers linked by natural and man-made canals of 1500 km length, extending from one end of the State to the other (Fig. 5). Backwaters excluding the canals are coast-parallel lake (eg. Vambanad Lake – 205 km^2), developed due to transgression-regression activities liked with sea level change and surrounded by recent sediments or coast-perpendicular (eg. Asthamudi Lake – 64 km^2) developed mostly in foundered river mouths and are surrounded by laterite landscape. They present a dynamic ecosystem and are the transitional zone between the aquatic and the terrestrial environments, sharing the characteristics of both.

The program of the field trip included other interesting geomorphic features such as sand ridges, mudflats, deltaic plain built with recent sediments, sandy plain composed of palaeo-beach ridges (near

Fig. 4. The quarry of laterite

Fig. 5. The small coast-paralell lagoon

Thottapally passes), 'Half Orange Relief', a feature developed in tropical rainforest area, where there is excessive production of sediments during monsoon and sudden drop of slope, sand beach (Kovalam).

Along the field trip participants have chance to examine the varied landform of the coast, including cliffs built with solid rocks covered by laterites, marine terraces formed sand beach interbedded with small peninsula built with crystalline rocks, sand beaches in front of costal plains or backwaters and estuaries of rivers.

The field trip participants warmly thanked organizers for their superb field trip. The organizers deserve special attention for coordinating a comprehensive agenda which coherently linked the diverse thematic, cultural and physical landscapes.

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