

# Understanding surf-zone hydro-morphodynamic processes in a typical pocket beach along the west coast of India

Satheeshkumar Jeyaraj, Indian Institute of Technology Bombay, [iskumarce@gmail.com](mailto:iskumarce@gmail.com)  
Balaji Ramakrishnan, Indian Institute of Technology Bombay, [rbalaji@iitb.ac.in](mailto:rbalaji@iitb.ac.in)

## INTRODUCTION

Coastal processes are natural processes that operate along coastal zones, resulting in morphological changes in erosion and deposition. The western coast of India is affected by extreme monsoonal wave activity, which can lead to the loss of beaches and vulnerability of the dunes. As a result, understanding actual near-shore physics and long-shore sediment transport becomes a prerequisite for the development of an effective coastal zone management strategy. The aim of this study is to quantify and investigate longshore sediment flux or rate as a result of wave action based on sediment trap experiments (Kraus 1987). The Kraus (1987) method, along with wave hydrodynamics and current measurements, is performed using acoustic instruments across the surf zone.

## METHODOLOGY

The study area, Malgund Beach, is located between (17°11'N 73°13'E) in the Ratnagiri district on the western coast of India. Wind-generated waves dominate this region, especially seasonally variable phenomena that alter the long-term morphodynamic of the beach. Pre-monsoon observation was therefore conducted to capture hydro-morphodynamic processes along the beach. Several instruments were deployed in a single cross-shore transect to measure tides, currents, waves, and long-shore sediment transport characteristics. The sensors were installed in the order of the Recording Current Meter (RCM), Miniature Wave Buoy and Acoustic Doppler Current Profiler (ADCP) at a depth of 5 m, 7.5 m and 10 m, respectively (Figure. 1). Developed sediment traps have been installed across the intertidal zone to measure both suspended and bed load transport rate. The main objective is to capture the entire coastal process more realistically in the field. In addition to this bathymetry, beach topography, sediment samples were also collected.

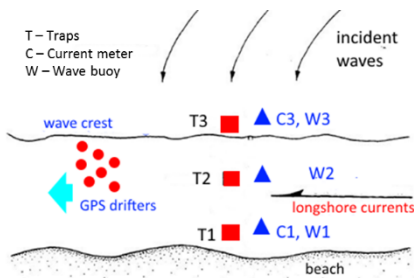


Figure 1 Plan view of field measurement methodology across the surfzone

## RESULT AND DISCUSSION

The characteristics of the nearshore waves were measured at several locations over different depth ranges, resulting in an understanding of the process of

transformation of the waves over this area. It is observed that the maximum wave height is range up to 1.4m and a significant height of 0.8m is approaching the south-west direction. The calculated breaker height is less than 1 m, indicating a moderate energy condition and an angle of oblique approach to the coast. In addition, due to shoaling, a slight increase in wave height is observed by the instruments deployed at outer surf zone. The observed tides are semidiurnal with a maximum range of 2.2m and 1.2m during spring and neap respectively. As a result, longshore transport is dominated by wave-induced longshore currents and a magnitude of 0.15 to 0.3m/s is observed across the surf zone. Sediment fluxes were measured at several locations along cross-shore transects at different seabed levels (Figure. 2). It indicates that sediment fluxes are generally decreasing upward, which reveals the maximum remobilization of sand that occurred near-bed zone, particularly over bars. Our results concluded that there was a strong upward decrease in longshore transport of sediment over bars, while more uniform vertical distributions were observed in troughs.

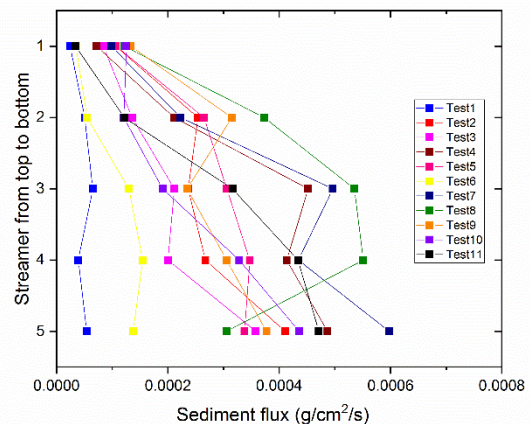


Figure 2 Lateral and vertical distribution of estimated sediment flux along cross-shore transects

## ACKNOWLEDGEMENT

The research is funded by National Centre for Coastal Research, Ministry of Earth Sciences, Government of India (Ref. No. MoES/ICMAM PD/Suppl.Order/81/2017).

## REFERENCES

Nicholas C. Kraus., (1987). Application of Portable Traps for Obtaining Point Measurements of Sediment Transport Rates in the Surf Zone. *Journal of Coastal Research*, 3(2), 139-152.