# Abstract

The PhD thesis focuses on Lake Towuti, Sulawesi Island (Indonesia), situated in the center of the Indo-Pacific Warm Pool region (IPWP) and its use as limnological archive. The climate history of the IPWP is of crucial importance for unravelling palaeoclimatological changes on decadal- to orbital-scale. The IPWP region has been proven to represent one of the main climatic drivers of the Quaternary but the region is so far poorly studied. However, the tropical Lake Towuti has a singular potential as a first, high-resolution, continuous limnological archive in an area, which is so far a critical gap in the Quaternary. Furthermore, Lake Towuti is the biggest lake out of the five Malili Lakes, which form a worldwide unique hydrologically connected lake system, the so-called Malili Lake System.

The main upcoming research questions are: (i) How did Lake Towuti develop? (ii) How did the sedimentation processes change through time and did they vary under different climatic situations occurring? (iii) Can the mass-movement deposits (MMD) in Lake Towuti be characterized chemically/mineralogically and can their triggering mechanisms be detected by the composition of the sediment? (iv) Did the hydrological connection of the three big lakes consist constantly during the past? Data presented here give a first answer to several open questions.

The study concerns 84 lake surface sediments, which cover the entirety of Lake Towuti, laterite samples of the catchment of Lake Matano, as well as ~136 m of continuous recovered sediment from Site 2, one of three drill sites of the International Continental Scientific Drilling Program (ICDP) Towuti Drilling Project (TDP), which was conducted in late spring 2015. All sample sets were analyzed sedimentologically, mineralogically, and geochemically.

The silty-clayey, mostly homogeneous surface samples were taken to understand modern supply and sedimentation processes during the last ~200-250 years and present the most recent material from Lake Towuti. Whereas, the upper 60 m of the TDP composite cores of Site 2 are generally heterogeneous and covering the last ~120,000 years. These sediments are dominated by the occurrence of MMDs, mostly turbidites, with significantly varying thickness and frequency. A few volcanoclastic sediment horizons and cm-thick pelagic sediments (PS) intercalate the MMDs. Later on the PS, including two diatom oozes horizons (up to 2.00 m), dominate the deeper sediments (composite depth >60 m/~ 450,000 years) and are intercalated with several thicker ash horizons (up to 1.80 m thick), and just a few MMDs. The sharp lithological change at ~60 m/~120,000 years represents the onset/formation of the Mahalona River draining. Furthermore, the extraordinary thick diatom oozes occur (directly) above tephra layers making it presumable that the tephra delivers nutrients, especially Si, which otherwise are restricted. Usually, nutrients are restricted in this hostile environment, which is the case for the depleted concentration of P and S but in contrast, an extremely high concentration of Fe as well as elevated values of Ni and Cr are unusual and leading to an absence of organisms.

The sediment surface samples providing multidisciplinary data, which define three, distinguished catchment types divided into five main supply areas. These areas can be traced back to distinct bedrock of the catchment by the specific sediment composition. The frequency and amount of sediment supply varies with the environmental conditions and strongly with the onset of the hydrological connection of the Malili Lake System ~120,000 years ago. Nowadays, fluvial transport and slope failure are the main transport mechanisms, whereas eolian transport is only relevant during the dryer interglacial periods. For the MMDs, the study reveals three main drivers being responsible for the frequent occurrences: (i) the instability of the Mahalona River Delta in Lake Towuti, (ii) the instability of the surrounding slopes especially during interglacial periods and/or El Niño years, which both go along with dryer conditions and a less dense vegetation and possible infrequent heavy rain, and (iii) higher magnitude earthquakes triggered by the tectonic situation of Sulawesi Island.