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Holocene storm track record from the southern Hemispheric Westerly Zone

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High resolution proxy records of Late Glacial and Holocene southern Westerly Wind activity are still rare and especially the frequency of strong storm track events is virtually unknown. Such events are accompanied by an extremely high precipitation of up to 500 mm/day and are associated with strong sea spray mobilisation. We present a lake sediment record from the southern Andes at 53˚S, located near to the western entrance of the Strait of Magellan. The record includes precipitation and wind-controlled proxies for the last 14,000 years since the transition from a Glacial clay to an organic-rich clayey sediment. The age model is based on 15 ^{14}C ages and two well-known and dated tephra layers. The 7.6 m long sediment core was retrieved from the small (Ø 250 m) and 22 m deep Lago Tamar with a restricted catchment of around 2 km^2. Bioturbation was absent and even small laminae are well preserved. The sediment core is characterised by frequent and cyclic variations in the terrigenous and biogenic content (e.g., 5-25 wt.% C_{org}). C_{org} and various terrigenous tracers (sediment gray scale and Al, Ca, Si contents) are very clearly inversely correlated ($r > 0.9$). The obtained resolution is subannual for the gray scale and around 5-10 years for the micro XRF and granulometry, and 30-100 years for other geochemical proxies. Most of the terrigenous-rich layers include reworked glacial clay which is outcropping and has been successively eroded from shallower parts (<15 m water depth) of the lake bottom during strong storm events (> 100 km/h) which have induced strong bottom currents. Relatively high Br/C and Se/C ratios in the terrigenous layers indicate an increased input of sea spray, as it typically occurs during strong storm events

at the coring site which is located close to the open Western Strait of Magellan. High C/N ratios of these layers also indicate an increased allochthonous terrestrial input of plant material, probably due to strong winds and an increased inflow of the small tributaries. The terrigenous layers indicate that periods of pronounced storm activity occurred with a frequency of around 210±30 years during most of the Holocene. Particularly strong storm events occurred in the early Holocene and during the Medieval Warm Period. Taking into account the sedimentation rates of 0.3-0.4 mm/year and the presence of some biogenic accumulation, the thickness of terrigenous layers indicate that such strong stormy periods lasted from months up to more than a year. Only during short intervals (i.e., 8200-7800, 4500-3800, 3200-2500 and 800-200 cal. years BP) such storm events were totally missing. Theses periods probably represent globally cold phases with a reduced atmosphere dynamics of the southern westerlies resulting in only limited storm events and restricted precipitation. These phases are characterised by high autochtonous C_{org}-content and relatively high Fe(Mn, Pb)/Ti ratios. They probably reflect an increased leaching of heavy metals at the interface between the granodioritic basement and overlying acid soils, because lower precipitations cause a drop of the pH of the soil water in the catchment area. Successively, the heavy metals were precipitated of as hydroxides in the less acid lake.