Typhoon and weathering processes on particles export to the ocean from a small river on the oceanic island of Taiwan

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Huge quantity of terrigenous particles was exported from oceanic island small rivers in delivering to the ocean (Dadson et al., 2003; Milliman and Syvitsky, 1992). Quantity of river particles entering the ocean could be related to river basin area, elevation, erosion rate, and seismic activity. However, limited data are available regarding differences between physical and chemical weathering on erosion and their effects on particles export from oceanic type of small rivers nor data on extreme event, the typhoon, and its effect on weathering at this setting. Here we report and quantify particles as well as dissolved materials export from an oceanic small river, the Lanyang River at the northeastern Taiwan, during typhoon period and those under normal weather condition. Our objectives are to quantify river particles and dissolved components export during normal and typhoon period; to understand factors controlling their variations; to compare efficiency of chemical and physical weathering under extreme weather condition and those at normal condition. River particles and dissolved components were sampled monthly and during typhoons at every four hours frequency and filtered, weighted for particle concentrations as well as chemical analyses of particle and dissolved compositions in lab. Chemical analyses include solid and dissolve silica, aluminum, iron, sodium, calcium, magnesium, and potassium as well as dissolved chloride, sulfate, and alkalinity. River discharge data were from Taiwan Water Resources Agency and precipitation data from Taiwan Central Weather Bureau.

Our results demonstrated that typhoon is the primary mechanism in driving concentration variations of both dissolved phases and solid components in the study river. Huge amount of precipitation flushed into river during typhoon, resulting in rapid dilution of dissolved components as well as rapid increase of suspended particles concentration in reaching hyperpycnal level. During the period of rapid increase of particles in the river, shift of types of particles as well as dissolve components were observed. TDS (total dissolved solid) represent a small portion of the materials export to the ocean. TSM (total suspended matter) flushed out of river during typhoon represent a major fraction (85%) of the annual total particles, however, the amount of particles for each typhoon varied significantly (from ~10 to ~45%).