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The major mass movements of the Western Dolomites (Italy)

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Major gravitational slope deformations are widely disseminated in the Dolomite Mountains (NE-Italy), one of the world′s most conspicuous landscapes and part of the UNESCO world heritage list. Because of their unique geological composition the Dolomites provide a natural laboratory where nearly all kind of mass wasting processes, in all dimensions, can be investigated. Simplified there are thick, rigid carbonatic successions (Triassic-Jurassic) resting on and interfingering with relatively weak successions of shallow marine clastic and of pelagic sediments. In some areas even volcanic successions and crystalline basement rocks are outcropped. Hugh rockslides and long run-out rock avalanches are limited to the carbonates and volcanic rocks. The superposition of Middle and Upper Triassic reefs, showing brittle deformation behaviour, above weak successions of evaporites, clays and marls, characterised by ductile deformation behaviour, leads to a classical "hard on soft" situation. The observable results are rockslides and rock avalanches of several hundred millions of m^3 in volume, large scale rock toppling and rock flows and deep-seated gravitational slope deformations (DSGSD). Within the weak successions slow moving rotational landslides and large dimensional earthflows are very common.

We focused our research on an area of about 40*40km within the Western and Northern Dolomites, where an inventory of the major gravitational mass movements has been compiled. We combined detailed geological maps with high resolution DEMs and extensive fieldwork data within a GIS-system. The different processes have been characterised and classified based on kinematic criteria, dimension and involved material. Altogether the database consists of 186 entries. Most frequently are landslides and earthflows (146) followed by catastrophic rockslides and rock avalanches (26) and DSGSDs (14). The spatial distribution of the mapped processes has been analysed in terms of the main geomorphological and geological characteristics, and of their clustering. For some of the most impressive sites age data has been established and allows a supra-regional comparison. For each type of investigated mass movement we present an exemplary case study that shows the most important features of the major slope failures within the Dolomites.