



Volcanic tsunamis: sedimentary signature and implications for hazard evaluation (Plinius Medal Lecture)

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I.

Tsunamis generated by eruptive activity and volcano flank instability (so-called "volcanic tsunamis") represent less than 5 % of all tsunamis listed for the four last centuries, seismic tsunamis being far more frequent (> 80 %). Nevertheless, at least 115 volcanic tsunamis were observed since 1600 AD, 54 of them during the XXth century, and the total death toll exceeds 54,000. About 25 % of all the fatalities directly attributable to volcanoes during the last 250 years have been caused by volcanic tsunamis. Almost 18 % of the significant volcanic eruptions during the last 400 years were associated with tsunamis, some of them being of great intensity (e.g. Krakatau 1883, Mayuyama 1792).

II.

A brief state-of-the-art shows that tsunami hazards related to volcanic activity and instability cannot be neglected. Insular volcanic arcs with high density of populations at the coast, such as Indonesia and Philippines, are the regions to watch. Gigantic flank failures of oceanic islands are also evidenced by tsunami deposits at high elevations (Hawaii, Canaries, Cape Verde, Reunion Island). Even if these processes are high magnitude but low frequency hazards, they must be considered in terms of hazards evaluation. In the second part of this lecture, we point out that more investigations are needed, especially on eruptive scenarios leading to tsunamis, interactions between eruptive mechanisms and wave generation, and related tsunami deposits.

III.

Tsunami deposits are the only records available for past tsunamis which are not listed in historical accounts. The third part of this lecture is dedicated to the presentation of a new typology of tsunami deposits related to volcanic activity and instability. Indeed, more than a record of volcano/tsunami history, these deposits holds clues to answering the critical areas previously identified (part II), especially when they are intercalated with volcanoclastic sediments and belong juvenile material (e.g. pumices).

IV.

Conclusions outline that volcanic tsunami must be considered in broader volcanic hazard studies. The first EGU session NH2.2 on volcanic tsunamis is an opportunity to address a first state-of-art, define grey areas and prepare future investigations coupling the tsunami community and the volcano community.