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Fluid dynamics of volcaniclastic turbidity currents

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Subaqueous sediment density currents have variable flow structures, depending on particle size and volumetric concentration. They form both in ocean basins and in volcanic districts where subaqueous density currents are generated by primary pyroclastic material entering the sea. A particular type of such flows is represented by volcaniclastic turbidity currents, which form by the subaqueous remobilization of primary pyroclastic deposits. In this work, a fluid dynamic model of volcaniclastic turbidity currents is presented and applied to the currents that generated the Craco (Southern Italy) volcaniclastic deposits. The deposits consist of thick laminated to massive beds, which formed from the remobilization of thin fine-ash pyroclastic fall deposits, in an area far away from the original volcanic source. Our model is based on the sedimentological features of deposits and on particle physical characteristics. It allows the calculation of velocity, thickness and Reynolds number of the current. Furthermore, a relationship between the current thickness, laminae thickness and paleo-slope angle is obtained, which allows to evaluate the thickness of the primary pyroclastic fallout deposit. Our model can be useful for obtaining an estimation of the primary distal ash dispersal by the carachteristics of the associated subaqueous volcaniclastic deposit. Details can be found in Doronzo and Dellino (2010), in press (JVGR, doi:10.1016/j.jvolgeores.2010.01.017).