GEOETHICS IMPLICATIONS IN VOLCANIC HAZARDS IN ARGENTINA:

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Geoethic implications in Volcanic hazards in Argentina: 24 years of uninterrupted ash-fall.

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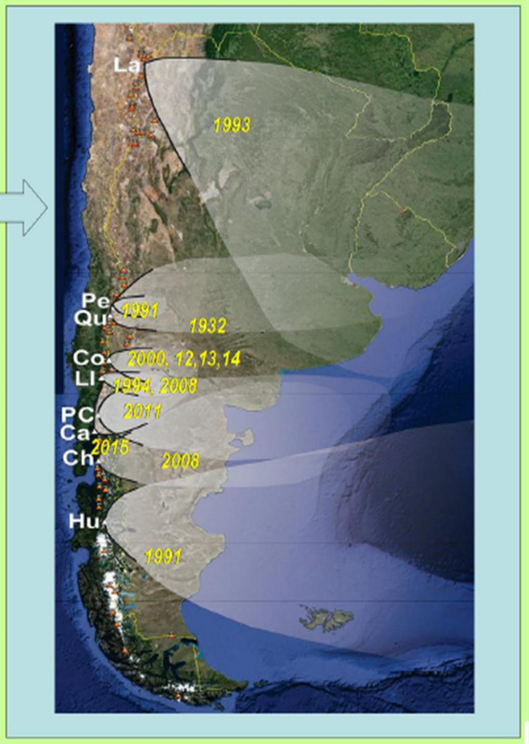
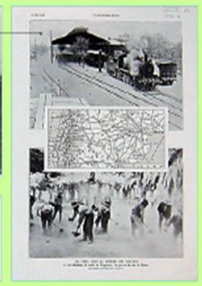
1.- Due to the absence of alerts on volcanic impacts during 60 years (from 1932, Quizapu-Descabezado Grande -one of the major eruptions of the XX Century- until 1991 Hudson eruption) there was mild remembrance of volcanic hazards in the collective memory of the Argentina citizens.

Argentina Andean Cordillera Cordillera Schematic image of ash plumes of Historical and Recent volcanic activity: From North to South: *La: Lascar (1993). Pe: Peteroa (1991). Qu: Quizapu (1932). Co: Copahue (2000, 2012, 2013). Ll: Laima (1994, 2008). PC: Puyehue-Cordón Caulle (2011). Ca: Calbuco (2015). Ch: Chaitén (2008). Hu: Hudson (1991)..*



1932 Quizapu - Descabezado Grande volcano eruption - ash fall affected cities and farming around 800 Km. Argentina.



2.- Since then and until April 2015, the social perception changed according to different social factors: age, location, education, culture, ..

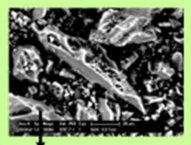
Above: Bridges and paved routes were destroyed by mud flows (secondary lahars) after heavy rains occured in the Patagonian estepa, 9 months after Puyehue Cordón Caulle 2011 eruption.
Photography by Sofía Adaniya Rovere

Right: While Copahue volcano reported Red Alert (SERNAGEOMIN 22 Dec. 2012) Tour Promotions invite free nights at Hotels and Spa as Christmas gifts.

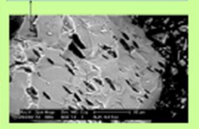
Left: While Calbuco volcano reruption was reported, Red Alert SERNAGEOMIN 22 April 2015,THE POPULATION WAS ALREADY PREPARED. Programs AGAINST BORING for children iprevented lung and eyes diseases by volcanic ash and dust in air suspension.

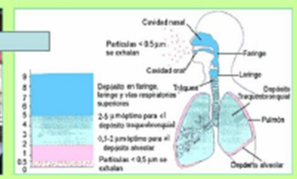
3.- This change in the perception of society about volcanic hazard produces a maze of challenges that go beyond the scientific knowledge. Volcanic health hazards began to be understood in 2008 after the eruption of Chaiten volcano.

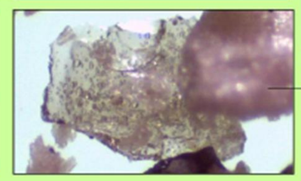
4.- The size of the ash particles and the silica composition were the main factors of concern on epidemiological monitoring. *IVHHN from UK and EL Agora Association in Argentina prepared an emergency plan of information .*



SEM - EDS microphotographs of shards from Chaitén volcano eruption on May 2008. Geochemicla analysis evidence high silica contents and Cristobalite. INTEMIN, SEM Lab.

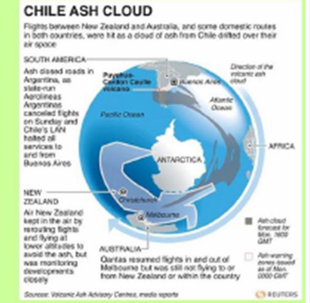






Microphotograph of shards from Puyehue Cordon Caulle 2011 eruption, deposited in the snow. The quick fragmentation of the glass shards produce diminute particles < 10 PM (microns) .Reflection LED Microscope Leica EZ 4 HD, SEGEMAR:

5.- In 2011 the volcanic complex Puyehue - Cordon Caulle eruption produced ashfall through plumes that reached densely populated cities like San Carlos de Bariloche and Buenos Aires.



6.- Farther away in South Africa and New Zealand ash plumes forced airlines to cancel local and international flights for several weeks.

24 YEARS OF UNINTERRUPTED ASH FALL

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The impact of falling ash reaches all human activities, has effects on human and animal health and is subject to climate and ecosystem of the affected regions. From 1991 until 2015 (24 years), more than 5 eruptions with VEI ≥ 4 in the Southern Volcanic Zone of the Andes occurred; pyroclastic, dust and volcanic ash were deposited (mostly) in Argentina. A recurring situation during eruptions of Hudson (1991), Chaiten (2008), Puyehue-Cordon Caulle (2011) and Calbuco (2015) volcanoes was the accumulation, storage and dump of volcanic ash in depressed areas, beaches, lakes, ditches, storm drains, areas of landfills and transfer stations. The issues that this practice has taken are varied: pollution of aquifers, changes in geomorphology and water courses, usually in "inconspicuous" zones, often in places where there are precarious population or high poverty settlements. The consequences are not immediate but the effects in the mid and long term bring serious drawbacks. On the contrary, a good example of intelligent management of the volcanic impact occurred many years before, during the eruption of Descabezado Grande (Quizapu) volcano in 1932. In that case, and as an example, the city of Trenque Lauquen, located nearly 770 km east of the volcano, decided a communitarian task of collection and burial of the ashfall in small areas, this was a very successful performance. The Quizapu ash plumes transported by the Westerlies (winds) covered with a blanket of volcanic ash the city, ashfall also reached the capital cities of Argentina (Buenos Aires) and Uruguay (Montevideo). Also, the bagging process of volcanic ash with reinforced plastics was an example of Good Practice in the management of the emergency. This This allowed the entire affected community to take advantage of this "mineral resource" and contributes to achieving collective and participatory work leading to commercialization and sustainability of these products availed as fertilizers, granular base for ceramics and bricks, abrasive cleaning powders, raw material for cosmetics, glass, porcelain, etc. From a geoscientific deontology point of view, there are a wide range of parameters to be considered in terms of the interaction of human activities, the rapid own decisions, the roll in front of our colleagues, and the responsibility towards society and the environment. The ethical implications of geo communication and education must be supported under standards and strategic plans that address all socio-cultural aspects and include primarily, women heads of households and teachers who will have to make decisions for their children in times of emergency. After the eruption of 1932 there was a gap of 59 years without a significant eruption and ashfall in Argentina. Why the actions taken for the use of volcanic ash as a resource were not repeated during the eruptions occurred in 1991 and beyond? This contribution intends to answer this question which has multiple variables that turn around the economy, politics and socio-cultural traditions of European immigrants in Argentina.