Impact craters generated by atmospheric megacryometeors: extreme natural events on a global and planetary scale

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Every year 40,000 metric tons of extraterrestrial matter is accreted by the Earth [1]. A small fraction of this material arrives at Earth as objects large enough to survive the passage through the atmosphere. Small bodies have left craters on all of the terrestrial planets and moons, and the Earth is no exception. Hence, impact craters are classically defined as geologic structures formed when a meteoroid, asteroid or comet smashes into a planet, a satellite or an asteroid. However, the research about the fall of large atmospheric ice conglomerations (megacryometeors) [2-8], has shown that there is another type of small (cm-to m-diameter) impact crater, which despite being formed by natural processes (unequivocally showing tropospheric isotopic signatures), does not have a cosmic, but rather terrestrial origin related with an anomalous (still unclear) behaviour of the atmosphere. These atypical impact craters should be considered as: 1) until now unknown and unexplored geological structures, which probably are preserved in the geological record, and b) the result of extreme natural events, whose recent multiplication, on a global and planetary scale, can be an indicator of serious environmental problems. Although a detailed historical review of such ice fall events confirms that there are many documented references of falls of large blocks of ice which go back to the ?rst half of the 19^{th}century, it also reveals that, mainly after 1950, the number of megacryometeor hits has spectacularly increased. More than 100 events have been witnessed and recorded, affecting practically the whole planet (Argentina, Australia, Austria, Canada, Colombia, India, Italy, Japan, Mexico, New Zealand, Portugal, South Africa, Spain, Sweden, The Netherlands, United Kingdom and USA). Some megacryometeors have been shown to weigh more than 100 kg and small impact craters, of up to 1 m in diameter, have been produced in Brazil (1997), UK (2000), Spain (2001 and 2002), South Africa (2006) and USA (2006) [8]. The apparent increase of these extreme atmospheric events, their hydrochemical and isotopic composition, and the anomalous tropopause behaviour and other significant factors detected coinciding with the ice falls (increase in humidity (near saturation but with no condensation), ozone anomalies and wind shear), all suggest the hypothesis that megacryometeors could be a new type of geoindicator [9] of Climate Change. Global Warming might be making the tropopause colder, moister and more turbulent, creat-

ing conditions in which ice crystals could grow, forming, unusually and much more recurrently, large ice conglomerations, which subsequently would fall to the ground, creating impact craters.

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