



## **Modelling of the wind field produced during a hurricane passage, correlation with the processing of pre and post event satellite images for the help in natural hazard risk prevention. A Case Study: The Island of Guadeloupe (FWI), 1989.**

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The hurricane wind impact may have dramatic consequences on life, property and infrastructures if the hurricane trajectory crosses inhabited island regions. Thus, during the pre-crisis phase, simulation of the wind field in the layer close to the surface may constitute a powerful tool for deciders in the taking of decisions. In this paper, the preliminary investigations, drawn by means of simulation techniques in order to determine the wind field established by the interaction of a hurricane with the island's relief and the link with the satellite imagery study and information from a hurricane event, are presented. In this work, the Oklahoma university mesoscale model ARPS (Advanced Regional Prediction System) has been used in relation to the numerical terrain model of the island of Guadeloupe and cyclonic vortex bogusing techniques in order to infer the island boundary layer wind field as organized during the hurricane Hugo's passage (1989). Two different numerical experiments have been drawn by using a large scale domain and a smaller one, corresponding to the same number of integration point domain but two different grid element lengths with lengths ratio equal to ten. The model initialization was made by means of the Météo-France local atmospheric sounding, whereby the hurricane was simulated by implementing an artificial (bogus) Rankine type vortex at a characteristic Hugo's centre trajectory location when the hurricane was close to the island, 16,18° latitude, -60,67° longitude at

9:30pm. Note that during these runs, the organization of the wind field resulted under the influence of the implemented island's relief and maximum sustained wind velocity as produced by the initial bogus. Further, since the damage degree is proportional to the sustained wind velocity, a potential damage distribution may be extracted from the calculated wind fields and compared to the real damage. A research and a data investigation made it possible to describe hurricane Hugo's passage on Guadeloupe, his intrinsic characteristics, the importance and space distribution of the caused damage on the land. Thus, numerical simulations are carried out with the Arps model and processing of concrete cases of an area disaster victim (North Grande Terre) is done, then one put in correspondence the elements of investigation of caused damaged with the speed of the wind in order to analyze the study and release zones of potential danger. At the same time is leading a procedure of recognition and comparison between satellite images before and after the cyclonic passage in order to carry out the detection of the damage. The Guadeloupe images at our disposal are 1989's Spot scenes with pretreatment of level 2B and 2A before and after the passage of the hurricane Hugo. They are 10m resolution panchromatic and 20m resolution colored. A more important attention will be paid to the zones of maximum potential danger cleared out earlier. At this stage the images processing implies detection and estimate, on local scales, of the destruction induced at the time of the cyclonic passage in these targeted zones in order to help for a future vulnerability estimation. Based upon the above conclusions, future investigations will concern the improvement of the bogus vortex in order to increase the accuracy of the real wind field conditions as well as the damage extraction from satellite imagery and the pertinent improvement of the relation between damages and sustained wind velocity in order to adapt this relation to the objective conditions of the island of Guadeloupe in order to permit the establishment of a cartography in connection with the vulnerability of the island concerning the potential risks correlated with the cyclonic winds for space-types (urban, forest), which is a tool for decision-making aid in the field of the climatic risks prevention.