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REAL TIME TESTING OF CN AND M8S EARTHQUAKE PREDICTION ALGORITHMS IN ITALY

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An overview of the application of the intermediate-term middle-range earthquake prediction algorithms CN and M8S (i.e. a spatially stabilized variant of M8 algorithm), for the analysis of seismicity in Italy and surrounding regions, is provided. The algorithms M8 and CN belong to a family of formally defined and globally tested procedures for intermediate-term middle-range earthquake prediction. The two different algorithms make use of general concepts of pattern recognition that permit to deal with multiple sets of seismic precursors, and allows for a diagnosis of the periods of time (TIP: Time of Increased Probability for the occurrence of a strong earthquake), when a strong event, with magnitude above a predefined threshold, is likely to occur inside a given region. A number of experiments have been satisfactorily performed to assess the robustness of the methodology against the unavoidable uncertainties in the input data and significant efforts have been made to minimize the subjectivity of the definition of the areas where precursors should be identified.

At present, Italy represents the only region of moderate seismic activity where the two different prediction algorithms CN and M8S are applied simultaneously for the routine monitoring of seismicity. For the application of M8S algorithm, seismicity is analysed within a dense set of overlapping circles, with radius increasing with the magnitude

of the target events and covering the monitored area. Three magnitude thresholds are considered, as defined by M6.5+, M6.0+ and M5.5+, where M+ indicates the magnitude range [M, M+0.5[. For the application of the algorithm CN a regionalization composed by three regions, outlined strictly based on the seismotectonic zoning and taking into account the main geodynamic features of the Italian area, is considered. The extension of CN monitoring to a fourth region, corresponding to the foreland areas along the Adriatic Sea, is proposed.

The first results from this prediction experiment, launched in July 2003 and aimed at a real-time test of M8S and CN predictions for earthquakes with magnitude larger than 5.4 in the Italian region, are illustrated. The results of the intermediate-term middle-range predictions in Italy are regularly updated every two months and a complete archive of predictions is made available on-line to a number of scientists (www.ictp.trieste.it/www_users/sand/prediction/prediction.htm), thus allowing for a real-time testing of the predictive capability of the applied algorithms. The results obtained up to the end of 2006 show that the algorithm CN predicted 12 out of the 13 strong events occurred within the three monitored regions (4 out of 5 predicted in real time), with a space-time volume occupied by alarms of about 30%. The algorithm M8S, predicted 63% of the strong of the events occurred in the monitored zones in Italy, i.e. 17 out of 27 events occurred within the area alerted for the corresponding magnitude range, with a space-time volume of alarms around 38%. The most recent successful predictions by the algorithm M8S is given by the M=5.8 earthquake occurred on October 26 2006 in the Southern Thyrrenian Sea.