On the quality of the hypocenter locations: source of errors and spatial distribution of uncertainties

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An earthquake is defined by its focal parameters which are its spatial location, hypocentral depth and origin time, and its magnitude. The focal parameters estimations could be considered as a classical geophysical inverse problem. The quality of the solution, precision and accuracy of the hypocentral parameters estimate, is function of multiple factors. Both systematic and random errors are generally introduced by i) the mathematical approach used to solve the forward and inverse problemsii) the simplified model used in source representation and seismic velocity of the subsoil, and iii) the quality of the data itself. In particular, data used in earthquake hypocenter estimationare the arrival times of the seismic phases derived from the analysis of the signals recorded by the seismic network of the monitored area. The number of stations, their geometrical distribution and spatial density, so as the signal to noise ratio of the recorded waveforms, are factors conditioning the hypocenter location quality. It this work we analyze the quality of hypocenters’ determination for the earthquakes recorded in the last 3 years by the Italian National Seismic Network managed by the INGV. First results show a strong spatial variability of hypocenters’ uncertainties, mainly dependent on the quality of the data.