GLOBAL-SEARCH RE-LOCATION OF REGIONAL, TELESEISMIC AND HISTORICAL SEISMIC EVENTS

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Regional, teleseismic and historical event locations are often plagued by poor station distribution, and by outliers in the data due to timing errors, phase miss-identification and velocity model errors. However, 1) the use of regionalized and 3D velocity models can reduce model errors, 2) the use of the Equal-Differential-Time (EDT) cost function gives an efficient, quasi-automatic identification of outliers, and 3) comprehensive information on the location uncertainty volume allows a reliable assessment of the location quality and the effects of station geometry. Global-search methods for seismic event location produce comprehensive uncertainty information, they are required for application of the EDT cost function, and they can be used easily with 3D velocity models.

In this presentation we examine global-search re-locations of large, historical earthquakes in Italy using the NonLinLoc software package (http://www.alomax.net/nlloc). These re-locations follow an iterative procedure: 1) initial, standard RMS/L2 and EDT locations using the raw phase data; 2) re-association of the EDT location phases and down-weighting of large outliers; 3) EDT re-location using the modified phase data; 4) multiple repeat of steps 2 and 3; and 5) a standard RMS/L2 location using the final phase data. A comparison of the initial and final RMS/L2 and EDT locations shows that this procedure typically produces greatly reduced average phase residuals, re-associates many phases (i.e. Pn to Pg, P to sP, S to SS ...), gives smaller and more regular location uncertainty volumes, and achieves stable depth determinations.