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TITLE: The 2009 L'Aquila Earthquake: Postseismic Deformation with High Temporal Resolution Using the new GPS "Carrier Range" Data Type

SECTION/FOCUS GROUP: Geodesy (G)

SESSION: Advances in Geodetic Imaging of the Earthquake Cycle (G21)

AUTHORS (FIRST NAME, LAST NAME): Elisabetta D'Anastasio[1], Geoffrey Blewitt[2], Nicola D'Agostino[1], Antonio Avallone[1], Daniele Cheloni[1], Monica Marzario[1]

INSTITUTIONS (ALL): 1. Centro Nazionale Terremoti, Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy.

2. Nevada Bureau of Mines and Geology/ Seismological Laboratory, University of Nevada, Reno, NV, USA.

ABSTRACT BODY: The availability of continuous GPS measurements during or soon after significant (Mw > 6) seismic events is important to record the coseismic displacements, the initial postseismic evolution and to evaluate their relative contribution to the overall crustal deformation and total moment release (both seismic and aseismic). Here we present the result of the analysis of continuously operating GPS permanent stations already active or rapidly deployed after the Mw 6.3 2009 April 6th L'Aquila earthquake. In contrast to the observations made for previous earthquakes in Italy, our observations capture the 2009 mainshock allowing an improved temporal resolution on the early postseismic deformation. In order to better define initial postseismic displacements and investigate sub-daily station motions we calculate epoch-by-epoch (0.1 - 30 sec) position time series with the new "carrier range" data type based on the JPL GIPSY-OASIS package. This new approach is based on the calibration of carrier phase data of each station using estimates of one-way carrier phase biases from an ambiguity-fixed network of ~3,500 stations worldwide [see Blewitt, Bertiger and Weiss, 2009 Fall AGU Meeting].

Carrier range data (a precise pseudorange data type) were constructed for GPS stations in the epicentral area, and were processed without carrier phase bias estimation. Time-dependent postseismic displacements were then modeled with a logarithmic time-dependent function. Since postseismic deformation begins immediately after the mainshock and is large within the first day following the mainshock, the actual estimate of amount of coseismic deformation depends upon the temporal character of the deformation and the availability of high-rate GPS time series immediately after the mainshock. The results of our analysis are then used to characterize the characteristics of the initial postseismic evolution after the 2009 mainshock and to investigate the time-dependent distribution of afterslip on the fault.

INDEX TERMS: [1242] GEODESY AND GRAVITY / Seismic cycle related deformations, [1207] GEODESY AND GRAVITY / Transient deformation, [8118] TECTONOPHYSICS / Dynamics and mechanics of faulting, [7215] SEISMOLOGY / Earthquake source observations.

Additional Details

Scheduling Request: Scheduled after Blewitt, Bertiger and Weiss - "GPS Carrier Range: A New Geodetic Data Type for Improved High-Rate Global Positioning and Seismo-Tectonic Applications", Fall AGU Meeting, 2009