Aim of this study is to investigate the relationship between moment magnitude (Mw) and source duration (i.e. corner frequency) for moderate to small magnitude earthquakes recorded in Central Apennines, Italy, including the 2016-2017 Amatrice-Norcia-Visso sequence. A data-set of ~6000 events in the magnitude range ~1 and 6.5 was used to retrieve a reference data set of source parameters by applying spectral decomposition approach (Generalized Inversion Techniques). The large population of analyzed earthquakes allowed us to investigate the scaling of the source parameters with the earthquake size, their variability with hypocentral depth and to characterize the scaling between local and moment magnitudes in the magnitude range from 1 to 6.5 (Deichmann 2017). Analyzing the same data-set and taking advantage of the available high quality data for small events recorded in the area, we focus on the scaling properties of clustered events in the magnitude range between ~1 and 3.5. By applying different methodologies, relying on cross-correlation analysis, we detect a preliminary set of clusters. Then, events within 2 km from the geographic location of each cluster were extracted from a very large (more than 500000 events) high-resolution earthquake parametric catalog. New cross-correlation analyses were carried out on stations within 50 km from the centroid of each previously identified clusters to pad each ones with low magnitude events (below 2). This multi-steps procedure allowed us to identified 2933 events belonging to 45 clusters. For an in-deep analysis of source properties, we focus on three clusters selected on the basis of the number of events and different hypocentral depth distributions. For each cluster, the P-waves pulse duration (equivalent to corner frequency) of the events were compared each other on different stations. Results clearly show that below Ml ~ 2 the pulses duration remains nearly constant also for stations with low kappa values, showing a saturation effects. For a comparison with the GIT and cross-correlation results we also evaluate source parameters using a method based on coda-envelope amplitude measurements (Mayeda et al. 2003) applying site and path parameters previously calibrated for Central Apennines by Morasca et al. 2019. This comparison from independent and completely different methodologies applied on the same clusters well agrees with the saturation observed in pulse duration, strengthen the results and allowed us to define, for the given network geometry and earthquake distribution, the magnitude threshold below which we believe it is not possible to
estimate source parameters. Moreover, our analysis of two clusters co-located on map but with different depth highlights a variation in stress drop with depth;