# Seminario
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Geodetic imaging of tectonic deformation: implications for earthquakes predictability

I will discuss how observed geodetic deformation relates to seismic activity and the predictability of stick-slip systems. I will first briefly describe multivariate statistical techniques and how they can be used to extract information from geodetic times series. I will present in particular a variational Bayesian Independent Component Analysis (vbICA). This technique is capable of separating tectonic sources and non-tectonic sources of deformation (e.g., deformation due to hydrology). After a brief summary of published work, I will present a study of the post-seismic deformation following the Mw 7.2, 2010, El Mayor-Cucapah (EMC, Mexico) earthquake and of Slow Slip Events (SSEs) in Cascadia from 2007 to 2017. For the EMC event, I separate in a natural way afterslip and viscoelastic relaxation. I further compare them with the seismicity and find that not only afterslip drove clustered seismicity after the earthquake, but also that long-range earthquake interactions were modulated by viscoelastic relaxation at large scales in space (>5 times the fault rupture length) and time (>7 years). Concerning the SSEs in Cascadia, the derived slip history offers the possibility to study the stick-slip behavior over multiple cycles. The data show a clear segmentation with a few major patches interacting with one another, a behavior that recalls that of a discrete body system. I use both classical embedding theory and extreme value theory applied to the study of dynamical systems to show that, where the Signal to Noise Ratio is sufficiently high, a low-dimensional (< 5) non-linear chaotic system is more appropriate to describe the dynamics than a stochastic system. It is possible to calculate major properties of the underlying strange attractor like its correlation and instantaneous dimension, its instantaneous persistence and a possible range for the metric entropy of the system. This knowledge is important for the determination of the predictability of the system, since it is related to the rate at which two trajectories in the phase space diverge. The findings show that SSEs in Cascadia can be described as a deterministic, albeit chaotic, system rather than as a random process. As SSEs might be regarded as earthquakes in slow motion, regular earthquakes might be similarly chaotic and predictable.
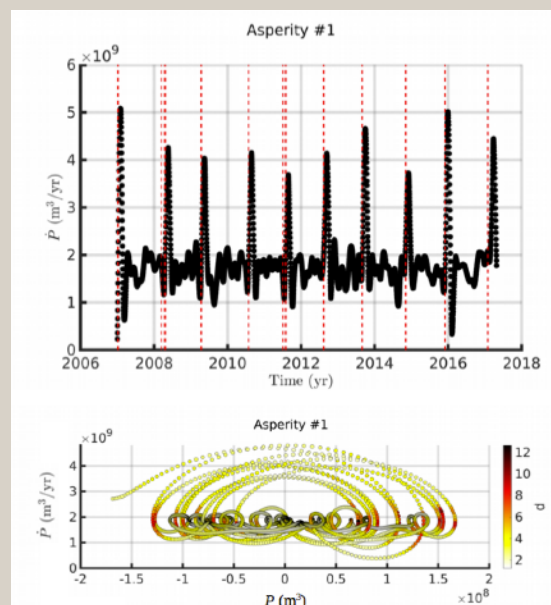
Data:	2 aprile 2019
Dove:	L.go S.L. Murialdo, 1. Aula C.
Orario:	12:00 - 13:00