International Seminar on crustal dynamics (2017/05/31)
COE seminar room 506, 5F, Earth Sci. Building 15:00 ~ 16:00

Title: From Crustal to Lithosphere Dynamics: a new approach to geodetic data interpretation and modelling

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Postseismic studies of geodetic data following large earthquakes indicate a wide range of mechanisms contribute to the observed deformation and stress relaxation. Both on-fault afterslip and off-fault viscoelastic relaxation can contribute to the postseismic transient phase of the earthquake cycle. One problem with these (quasi-) dynamic models is that there is a wide range of parameter space to be investigated, with each parameter pair possessing their own tradeoffs. This becomes especially problematic when trying to model both on-fault and off-fault deformation simultaneously. Here, we draw insight from postseismic geodetic observations following the 2016 Mw 7.0 Kumamoto earthquake by utilizing a novel inversion technique.

We present a novel approach to invert for on-fault and off-fault deformation simultaneously using analytical Green's functions for distributed deformation at depth [Barbot, Moore and Lambert., 2016] and on-fault deformation [Okada 1992, Nikkhoo and Walter 2015]. Using these Green's functions, we jointly invert InSAR images and GEONET GPS time series following the Kumamoto earthquakes for afterslip and lower-crustal viscoelastic flow.

The calculated strain-rates in the lower crust are directly converted to effective viscosities and we investigate the implications of the effective viscosity structure within a Bayesian statistical framework to estimate in-situ parameters, such as temperature. Using our new method, we are able to interrogate the transient deformation in the first few months of the postseismic deformation to obtain these parameters.