Earth Hazards Consortium Questions – Paul Segall, 8 February 2007

SFU

Please explain the procedure for inverting the GPS observables and what are the 3D position uncertainties/confidence? *(Segall et al. (2006), Terry)*

MTU

Is there enough island-wide instrumentation to know if there are other areas of slip? Even though Kilauea is the most volcanicly active, could this kind of slip occur elsewhere on the island? (Julie H.)

Buffalo

How is the decollement defined? Only seismically, or are there other constraints? Is it real or theoretical? Could sills be intruding along it? Does it correspond to the 8 km silent slip surface? *(Segall et al. (2006), Marc)*

UBC

Regarding listric faults, what is the importance of the angle of decollement. In terms of modeling, how would you incorporate all of the data such as correlating vertical GPS, horizontal GPS as well as the tilt meters? (*Modeling decollement angle Paper)*

UNAM

Is it possible that the movement of the southern flank of Kilauea volcano indicates a slumping type slip? And if so, is it possible that several movements of the megablocks in which the slumping-type-slip is divided would produce the difference in the recorded movement by GPS?

Colima

Question 1 (*Slide 20 and others*)
How slow would the offset need to be to produce no seismic signal? What are the physical mechanisms of such slip?

SFU

1. Silent Slip (Paper Nature "Earthquakes triggered....")

There seem to be a variety of events: slow slip, tremor, co-seismic events,earthquakes, etc. What are the differences? It seems that these slip events may happen silently without, or in the absence of detectable tremor. Is this so? (Terry)

ASU

Owen et al. states that aseismic creep occurred following the 1975 earthquake, but not the 1989 earthquake (which was located farther east). Are there any known petrologic or sedimentalogic variations that could cause this discrepancy (e.g., differences in sediment thickness, hydrothermal alteration products)?

UBC

Paper: Nature "Earthquakes triggered…"
How do faults "unpin" (mechanics of the process)? How would a silent earthquake "unpin" a fault? Over what time scale? How can this be explained regarding movement along the fault?

MTU

1. It seems that the aseismic slip triggered a swarm of smaller earthquakes in the adjacent area. In this case we have two different behaviors in the two regions: non brittle failure along the aseismic displacement and brittle failure along the seismic swarm area. What accounts for this different behaviors in both areas? (Rudiger)

Colima

Question 2 (*Slide 38, Figure 4, Segall et al. 2006*)
Could you please explain the image presented on slide 38, Figure 4 in ¨Earthquakes triggered by silent slip events¨ (Segall et al. 2006).

Buffalo

We noticed that in the JGR Owenet.al. paper an opinion was cited stating that a flank sliding under the force of gravity would not allow for 'trapped' dike intrusion, which is common. The paper concluded that flank motion IS gravitationally driven. Rifting and magma chamber inflation were also cited as possible causes of flank motion. What are the relative contributions of gravity vs. magma chamber inflation/rifting in flank motion? If it is gravity driven, is the rifting active or passive? (Sarah)

ASU

Does a feedback relationship exist between slope failure and dike intrusion? Will aseismic failure contribute to dike propagation?

UNAM

What are the maximum magnitudes expected for earthquakes generated by dike intrusions along rift zones?

ASU

Have there been any experiments to test the range of pore fluid pressures that particular materials can withstand before aseismic failure occurs? Would such experiments prove useful for hazard mitigation if applied to the Hawaiian islands? Would the increased pressure due to the water column contribute to slope stability offshore or would it increase pore fluid pressures in this area? Are pore fluid pressures more likely to have an effect in more shallow regions than deeper regions?

McGill

What is the connection between the deep slide plane(as inferred from the 1990-1996 GPS data and the 2005 event) and the shallow slideplane as inferred from the 2000 event? What are the consequences for flank stability and hazard assesment?

Buffalo

Are the microseismic signals of the block movement attenuated by fluid interference/clay minerals at the base? (Erik)

Colima

(slide 30) If the earthquakes are in a shallow level (around 8 km), why are they not clearly above the faulting area?

MTU

(Slide#18) Are the "silent"/slow earthquakes a result of flank spreading: the need for Kilauea to expand due to overburden or magmatic events or is it possible that inflation on Mauna Loa creates stress? (Julie H.-)

Colima

The small seismic events that happened during the 2005 earthquake, could these be clear signals of the direction of displacement in the south flank of the island?

UNAM

What landslide volumes are needed to produce a significant tsunami? Is there an idea on how catastrophic a Tsunami can be in case that the Kilauea volcano collapses?