Preliminary list of EHAZ Class Questions for 3/9/2007

Colima

Failure

1. Can dome collapse/removal of mass cause the volcano to rebound and rise back up? Can this be seen in the field?

Modeling

2. (Slides 16, 17) How does the timescaling in the model translate into real life? Do any of your models show very rapid, catastrophic processes?

3. What happens if the edifice rests on two substrates of differing strength e.g. half on granite, half on mudstone?

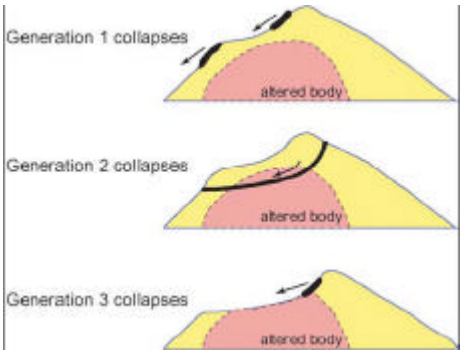
4. (*Slide 27)* Real-life debris avalanche deposits show 'smearing out' and mixing of different lithologies during transport. How is this reflected in the models, which mainly show development of faults?

5. What would be the effect of a different gravitational field? How would the models collapse on other planets?

UNAM

1. In the Jocotitlán volcano (México) there exist megablocks with folded lake sediments that were interpreted as bulldozed by the avalanche and folded due to this process. Do you know these deposits? Could it be anticline folds formed by the load of the volcano over the ductile substrate and currently bad interpreted? (Hugo Murcia)

2. (Cecchi et al. 2005, Figure 17) The occurrence of the first generation-type of collapses determines that the next collapse is going to be of the second generation type and so on? (Natalia)



3. *(Cecchi et al. 2005)* What type of collapse could have been the Socomba if it had had a weak core like Casitas volcano? (Ana)

4. (Cecchi et al. 2005) Is there a relationship between the % of deformation and the risk of collapse of the structure´s flank? (Alejandro)

5.(Slide 16-20) What type of materials was using to obtain these analogous models? What is the different between elements set used by experiments and the reality? What Physical stability conditions must be developed? (Victor)

University at Buffalo

Collapse mechanisms (BVWDV 2001)
1. Can substratum extrusion be catastrophic? How can this be a granular flow with so much overburden? How are the dip-slip and deep decollements coupled? Is it possible for a lower layer to move faster than the one above? (Marc)

Flank Spreading/Collapse Modeling (BV 2005)
2. Considering scale, which of your analog experiments have you thus far been able to connect with real life examples of collapse/spreading phenomenon? Also, although symmetric deformation is thought to be less common in nature, it seems that in the model (fig. 5B) the result ended with a slightly asymmetric ring structure. This feature is something we can observe in nature such as Villarrica Volcano, Chile. Is it possible for this type of structure to be quite common in situations that were originally thought to be a caldera collapse type feature rather than a deformation collapse feature? (Erik and Leila)

Remote Sensing
3. While reading through the various papers, my immediate thought on a lot of the subjects was "You could use remote sensing for that". For instance: Landsat and other multi and hyperspectral satellites to detect hydrothermal alteration; SRTM/LIDAR/DEMS to possible identify these structures or deformation; INSAR to detect deformation. I'm wondering if these sorts of things have been done in relation to this work, or if it is a problem of timescales and lack of data. (Sarah)

MTU

Failure
1. *(Slide 28,30)* Is the entire structure of the volcano weakened after the collapse (primed for future failure) or is it stabilized?

Modeling
2. Have you attempted to add a force besides gravity (simulating earthquakes) to your analogue experiments to determine what structure (shape) is more prone to collapse?

3. *(Slide 29)* In this model you have used a layer that is more cohesive. What was the composition of this unit? It appears that only one layer has a different composition, have you tried inter-layering different cohesive strata? Also, is it beneficial to use poorly sorted layers to represent a mixed composition?

McGill University

Failure
1. Are catastrophic flank collapses necessarily associated with active magmatic systems?

Monitoing
2. For volcanoes which are already being monitored, is there any record indicating gravitational sagging and spreading of the basement, and how would you distinguish

gravitational sagging from sagging due to the deflation of a deeper magma chamber, for instance?

ASU

1. In your conclusions you state that only a small fraction of altered rock is necessary to create an unstable edifice and aid in deformation (10% of the total volume edifice). Would this need to be localized? On what time scale would this amount of alteration take place? Have any collapses been recognized associated with less than 10% hydrothermal alteration?

2. The Cecchi et al 2003 paper also states that it was difficult to determine the effect of the dimensionless parameter ($?_4$) which takes into account the difference in the unit mass of fresh and altered rock. That being said, how was the 10% volume edifice alteration determined?

3. Has anyone developed, through experimentation or theory, a quantifiable relationship between lithology and size of a volcanic edifice and the lithology and thickness of the underlying layers to constrain the likelihood of flank spreading vs. extrusion?

Remote Sensing

4. From this work you suggest DEM from the Shuttle Terrain Mapping Mission to determine the number of volcanoes with this type of flank spreading. This is a great idea, but seems like it would take a lot of work. Is there some kind of model or program one could create/write that would recognize certain morphological characteristics of deforming volcanoes likely to collapse, or would this all have to be done by an individual for each volcano?

   a. Have you considered some kind of scale for volcanoes with higher potential to collapse versus those with lower potential (given amount of fumarole activity, basement geometry, faulting, overall edifice morphology, etc). There seems to be quite a bit of potential hazard mitigation that could come out of this work. Has any one attempted this yet on a global scale?

SFU/UBC

Modelling

1.What type of silicon putty was used? Could Ben give more detail on the analogue materials used? (Terry)

Faulting/Spreading Mechanisms and Influences (Nathalie/RE/Heather)

2. What is the effect of erosion and local tectonics on the style of gravitational relaxation of a volcano: Can erosion effectively counteract gravitational instability? How would local extensional/compressional/transtentional tectonics effect the type of faults developing on the volcano and it's overall stability.

3. In the discussion section of the Bull. Volc. paper, a deformation rate increase is explained (p.89), which leads to increased instability within the volcanic edifice. Briefly, microfractures and fracture coalescence is broached- which may dictate the 'catastrophic collapse mechanism.' Do these microfracturing events all occur simultaneaously? How are these fracture mechanics included in your analogue or numerical models? Off topic, do you think these microfracturing events would produce a seismic signal?

Can data regarding the degree of alteration in a volcanic conduit (ie. Unzen drilling project, alteration of kimberlite) be used to infer the degree to which these volcanoes are/were susceptible to flank spreading?