Week 3 notes: Progressive deformation

Fall 2005

1 Reading assignment

Progressive strain histories are covered in section 15.5 (pages 308ff.) of Twiss and Moores. Also read pages 352 to 357 ("Strain in shear zones"). Nice treatment of this sort of thing is also found in the introductory chapters of Passchier et. al. (1994) *Microtectonics*, which unfortunately has gone missing from the library.

We will begin discussing material responses to stress on Monday. Readings for that will be drawn from chapters 18 and 9.

2 Progressive strain in pure shear

In lecture, we discuss possible strain histories for lines of various orientations that undergo progressive strain. (In lab, we deal with the case of pure shear).

By **progressive strain**, we simply indicate that in our analysis we will break down the deformation history into many small steps. At each step we will consider both the **infinitesimal strain** that accrues at that step, and the **finite strain** that has accrued up to that point. Even in very simple cases, some rather complex behavior can result.

The analysis considers one of the "simplest" kinds of strain: **pure shear** in two-dimensions, i.e.:**plane strain**, $\epsilon_2 = 0$ and $\lambda_2 = 1$.

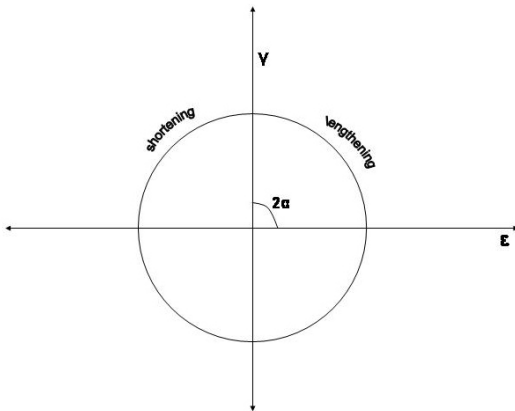The following four figures accompany the in-class discussion. Use the margin and annotate these.

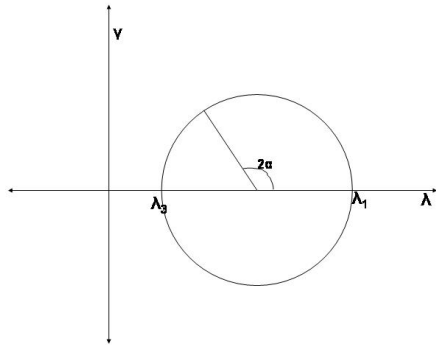Figure 1: Mohr circle for Infinitesimal strain

Figure 2: Mohr circle for finite strain, unstrained state reference frame
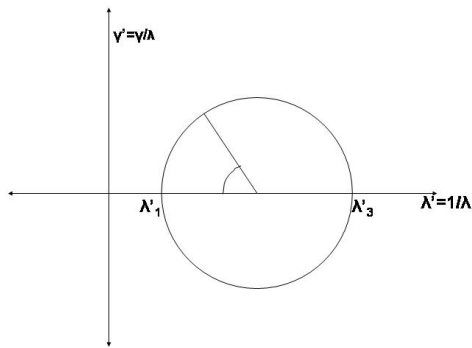

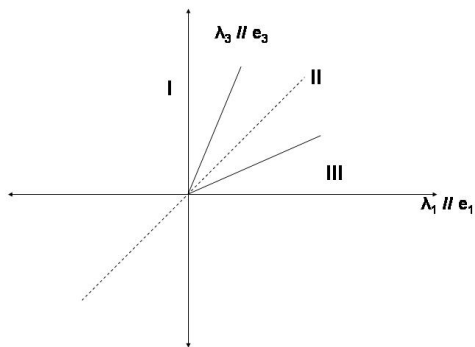Figure 3: Mohr circle for finite strain, strained state reference frame

Figure 4: "Real world" reference frame. Relationship between lengthening and shortening histories and angle to principal strains