ABSTRACT

An abstract of the thesis of Scott Benjamin Braunsten for the Master of Science in Geology presented April 10, 2009.

Title: Subsurface structure of the Lower Klamath Lake and Tule Lake basins, California, investigated using gravity anomalies

The subsurface geometry of geologic units in the Lower Klamath Lake and Tule Lake basins, northern California, is investigated using anomalies in the regional gravity field together with other geologic data. One hundred and eighty five new gravity stations were acquired in order to fill data gaps in important areas, in particular over Lower Klamath Lake. The gravity data are reduced using standard methods and combined with existing data sets. Horizontal variations in the resulting gravity anomaly map, along with estimated density contrasts among lithologic units and contact depths recorded in well logs, are then used to infer subsurface geometry along three profiles, one of which crosses Sheepy Ridge, a prominent topographic feature trending north between the Lower Klamath Lake and Tule Lake basins, and the location of the Gillem Fault, a major structure in the area. That goal is accomplished here using a commercial software package, Oasis Montaj, to implement a forward modeling approach.

The present work improves on prior estimates of basin depth and illuminates structural features associated with Sheepy Ridge and the associated Gillem Fault.
The Lower Klamath Lake basin contains up to 2,000 m of sediment fill and the Tule Lake basin is up to 1,500 m deep. Overall, the Lower Klamath Lake basin is deeper than the Tule Lake basin and has a deeper mean depth. Sheepy Ridge is found to be composed of relatively high density material bounded by a set of parallel or sub-parallel east-dipping faults. Other subsurface faults (contacts between materials of different densities) and probable eruptive centers are also located. The structural interpretation presented here is consistent with other work, suggesting pull-apart basins caused by regional extension in the study area.