GEO-FAQS #1 – General Geologic Features

Denali National Park and Preserve

Prepared by P. Brease, May, 2003

MT. MCKINLEY

1. **Is Mt. McKinley a Volcano?** No. Mt. McKinley is a *granitic pluton* (a blob of magma or "lava" that has cooled and solidified beneath the surface at perhaps tens of kilometers down). Over tens of millions of years, Mt. McKinley has been uplifted by *tectonic pressure* (collision of the pacific plate with the North American plate) while at the same time, erosion has stripped away the mostly sedimentary material above and around it. (Portions of slightly older sea floor rock (flysch) are found near the 20,320' true, or south summit, and they completely cap the 19,470' north summit of Mt. McKinley.) The crystallization age of the Mt. McKinley granites is around 56 million years ago, giving it plenty of time to be uplifted and eroded to it's present lofty condition. It does so happen that the Cantwell volcanic rocks (like those at Polychrome Pass) are the same crystalline age as Mt. McKinley and may they be the volcanic equivalent of the McKinley Granite (see GEO-FAQS #3).

2. **Why is Mt. McKinley so High?** Some mountain in any given area has to be the highest! However, Mt. McKinley is a *granitic pluton*, a blob of magma or "lava" that has cooled and solidified beneath the surface at perhaps tens of kilometers down (see figure 1. below). Granite is a very hard rock material that is much harder than it's neighbors (mostly sedimentary rock) and resists fracturing and weathering much better than the soft sediments (primarily sandstones, shales & limestones). Therefore, as the Alaska Range is uplifted, the granitic mountains, such as Mts. McKinley, Foraker, and a few others are more likely to "bob" upward as the granite is generally lighter in weight than the surrounding sediments, and the hard, resistant nature of the granitic blobs act like marbles in a pudding as the uplift affect continues to push them higher. Additionally, Mt. McKinley is likely to get an extra "boost" from the surface of the subducting Pacific Plate, as it scrapes past the root of Mt. McKinley at a depth of about 120 to 150 kilometers below the surface.

3. **Is Mt. McKinley Still growing?** Yes. Continuous tectonic pressure (the Pacific Plate pushing northward into & beneath North American Plate) is buckling & up thrusting the Alaska Range, probably resulting in the more resistant rock bodies, such as the McKinley granites, rising and maintaining higher elevations continuously (see question #2 above). This uplift has be going on for probably 10's of millions of years, and two recent studies (Plafker and others, 1992, & Fitzgerald, Stump and Redfield, 1993) suggest that rapid or renewed uplift has been ongoing since about 5 million years ago. The rate of uplift proposed through this research is 1 millimeter per year (fingernail thickness). Most of central Alaska is also on the rise due to both tectonic pressure, and glacial *isostatic* rebound. Seismic evidence suggests that the boost beneath Mt. McKinley is almost continuous (see #2 above).

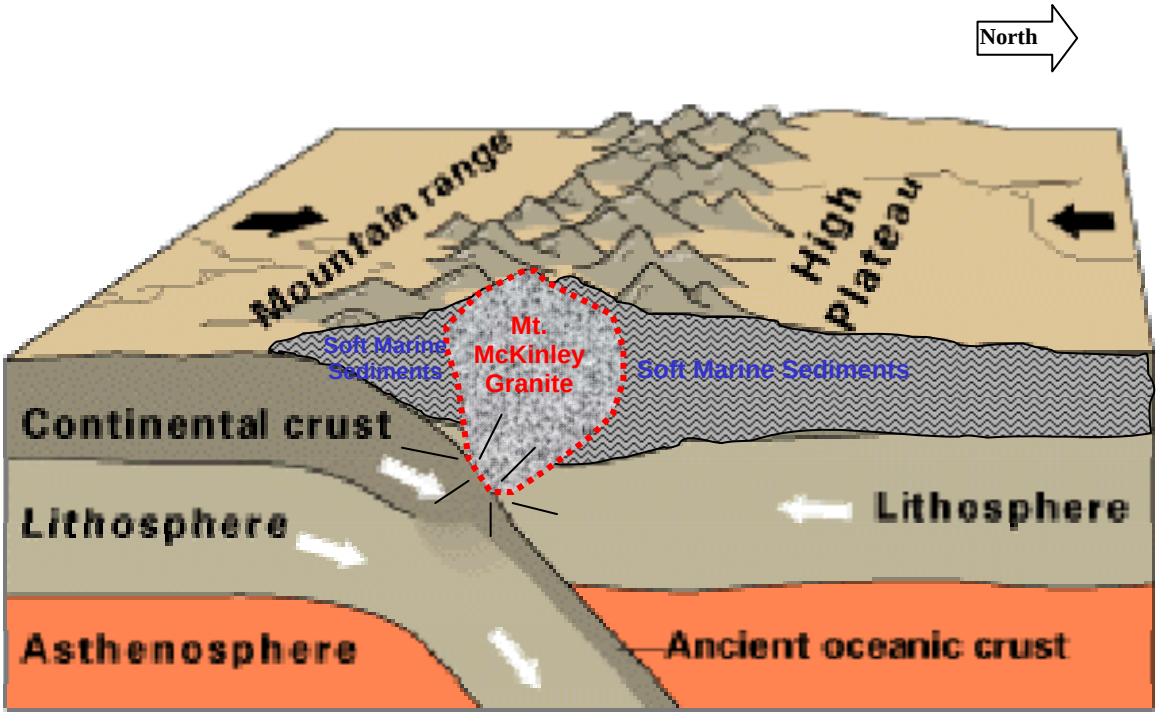

Figure 1. Cross-Section of Subduction Beneath Alaska Range Showing uplift effect on Mt. McKinley