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Mono Lake excursion in the U.S. Great Basin

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Nevada, Utah, and California east of the Sierra Nevada are in the Great Basin physiographic province of western North America. During periods of the Pleistocene, Lake Bonneville and Lake Lahontan covered valleys in Utah and Nevada, respectively, and other lakes such as Lake Russell in east-central California did likewise (Feth, 1964). Now dry except for its remnant, Mono Lake, Lake Russell provides an opportunity to study behavior of Earth's past magnetic field in lacustrine sediments that are exposed in natural outcrops. The sediments have been of particular interest since the discovery of the Mono Lake Excursion (MLE) by Denham and Cox (1971) nearly 40 years ago because the field behavior can be documented at numerous sites around Mono Lake (Liddicoat and Coe, 1979, Liddicoat, 1992; Coe and Liddicoat, 1994) and on Paoha Island in the lake. Moreover, there have been recent attempts to date the excursion (Kent *et al*., 2002, Benson *et al.,* 2003) more accurately and use the age and relative field intensity in palaeoclimate research (Zimmerman *et al*., 2006).

The excursion in the Mono Basin has an older part that is negative inclination ($\sim$ -30˚) and west declination ($\sim$ 300˚) during low relative field intensity. Those palaeomagnetic directions are closely followed by steep positive inclination ($>$ 80˚) and east declination ($\sim$ 100˚) during higher relative field intensity. A path of the Virtual Geomagnetic Poles (VGPs) for the older part followed from old to young forms a large clockwise loop that reaches 35˚N latitude and is centered at about 35˚E longitude. That loop is followed by a smaller one that is counterclockwise and centered at about 70˚N latitude and 270˚E longitude (Denham and Cox, 1971; Denham, 1974; Liddicoat and Coe, 1979). The excursion elsewhere in the Great Basin and in western North Amer-

ica is recorded as nearly the full field behavior at Summer Lake, OR (Negrini *et al*., 1984), but only as the younger part of steep positive inclination/east declination in the Lahontan Basin, NV. The overall relative field intensity during the excursion in the Lahontan Basin mirrors very closely the relative field intensity in the Mono Basin (Liddicoat, 1992, 1996; Coe and Liddicoat, 1994).

It has been proposed that the excursion in the Mono Basin might be older than originally believed (Denham and Cox, 1971; Liddicoat and Coe, 1979) and instead be the Laschamp Excursion (LE), $\sim$ 40,000 yrs B.P. (Guillou *et al*., 2004), on the basis of 14C and 40Ar/39Ar dates (Kent *et al*., 2002) and the relative palaeointensity record (Zimmerman *et al*., 2006) for the excursion in the Mono Basin. On the contrary, we favor a younger age for the excursion, $\sim$32,000 yrs B.P., using the relative palaeointensity at the Mono and Lahontan basins and 14C dates from the Lahontan Basin (Benson *et al.*, 2003). The age of $\sim$32,000 yrs B.P. is in accord with the age (32,000-34,000 yrs B.P.) reported by Channell (2006) for the MLE at Ocean Drilling Program (ODP) Site 919 in the Irminger Basin in the North Atlantic Ocean, which contains as well an excursion lower in the core at $\sim$ 40,000 yrs B.P. that he identifies as the LE, and by Lund *et al.* (2005, 2006) from a study of sediments recovered during the ODP. The paths of VGPs for the North Atlantic Ocean and the younger half of the excursion in the Mono Basin are similar in that they have a counterclockwise loop and are close to each other in the mid-Northern Hemisphere, and are different from the VGP path for the LE that is a large clockwise loop in the Southern Hemisphere (Channell, 2006; Lund *et al.,* 2005, 2006).

Our presentation will include the results of research at Searles Lake, CA, in the southern Great Basin where a record of palaeomagnetic field behavior and palaeoclimate are preserved in exposed and cored sediments (Liddicoat, 1976, Liddicoat *et al*., 1980; Smith *et al*., 1983) that span the proposed ages of the MLE and LE.