Figure 1. Location and magnetic polarity of volcanic sections.
a.) Well behaved AF demagnetization to 190 mT of normally magnetized specimen nm0305a from the North Mickey section. NRM = 3.9 A/m.

b.) Orthogonal vector diagram in stratigraphic coordinates of specimen pm12A02a from the Pueblo Mountains section which dips 20˚ to the west. The normal viscous overprint is removed at about 11 mT and then the reversed ChRM decays univectorially toward the origin. The overprint direction is to the west of the expected GAD field but is very close to the expected GAD field in geographic coordinates, indicating that it is a normal viscous overprint acquired after tilting of the section during the most recent (Brunhes) normal polarity chron. NRM = 2.6 A/m.

c.) Orthogonal vector diagram showing complete removal from specimen pm0402a of a westerly lightning IRM by 25 mT AF demagnetization. The ChRM then decays univectorially toward the origin between 25 and 180 mT. NRM = 4.7 A/m.

d.) Stereonet plot of the AF demagnetization of the same specimen (pm0402a); lightning IRM is removed by 25 mT.

e.) Stereonet plot of the AF demagnetization to 180 mT of specimen pm0407a from the same flow as c.) and d.) shows a strong lightning overprint which is not completely removed but the great circle path is heading toward the flow mean direction. NRM = 17.3 A/m.
Figure 3. Determining the flow mean direction of flow 9 at the Pueblo Mountains section. Specimens 1, 2, 4, 6, and 7 yielded stable directions that decayed univectorially to the origin. Specimens 5 and 8 were overprinted with lightning but decayed along great circles toward the cluster of stable directions. Specimen 3 was rejected from the mean as an outlier. Its anomalous direction may be due to orientation error, core labeling error, or taken from a block that had moved. These outliers are rare. This flow mean direction was determined by the method of McFadden and McElhinny (1995).
Figure 4. Shaded contour maps of the four sections. Selected sample locations marked.
Figure 5a. Secular variation from a similar latitude as the study area. The historical magnetic field direction as determined from archeological artifacts in Germany, 600 BC to present (data from Schnepp and Lanos, 2005).

Figure 5b. At Pueblo Mountains the field movement makes a little over one loop with some internal complexity. Comparison to a modern magnetic field movement record at a similar latitude (see above) suggests an eruption duration of 1-2 ka. All flows (not directional groups) are shown, from the continuous section only.
Figure 6. The paleomagnetic field path at Summit Springs and Steens Mountain. See text for discussion.
Figure 7. The paleomagnetic field path at North Mickey is similar to the end of the path at Steens Mountain. See text for discussion.

Field direction
- down
GAD field
- normal
Figure 8. The paleomagnetic field path at Guano Rim suggests a short eruption duration. See text for discussion.

Guano Rim

Field direction
▲ up

GAD field
★ reversed
Figure 9. Non-transitional site-mean directions for the four new localities of this study and for Steens Mountain (Mankinen et al., 1985). For reversed directions the antipodes are plotted. The directions have been rotated so that the mean of the distribution is at the center of the equal area projection.
Figure 10. Site-mean north virtual geomagnetic poles for the four new localities of this study and for Steens Mountain (Mankinen et al., 1985). Locality-mean poles and corresponding circles of 95% confidence are shown.
Figure 11. $^{40}$Ar/$^{39}$Ar ages from Summit Springs.

a.) Flow ss02; Plagioclase, 250-425 um.

Apparent Age (Ma) = 16.72 ± 0.29 Ma (16.61); MSWD = 0.38

b.) Flow ss02; Plagioclase, 250-425 um.

Age = 16.84 ± 0.40 Ma (16.73)
Initial $^{40}$Ar/$^{39}$Ar = 285 ± 22
MSWD = 0.33

c.) Flow ss09-1; Plagioclase, 63-180 um.

Apparent Age (Ma) = 17.14 ± 0.36 Ma (17.03); MSWD = 0.39

d.) Flow ss09-2; Plagioclase, 180-300 um.

Apparent Age (Ma) = 16.71 ± 0.38 Ma (16.60); MSWD = 0.39

e.) Flow ss09; groundmass 600-850 um

Integrated Age = 16.68 ± 0.16 Ma (16.57)

f.) Flow ss18; groundmass 600-850 um

Integrated Age = 17.3 ± 0.6 Ma (17.2)

Age = 16.71 ± 0.38 Ma (16.60); MSWD = 0.39

g.) Flow ss18; groundmass 600-850 um

Age = 16.16 ± 0.16 Ma (16.06)
Initial $^{40}$Ar/$^{39}$Ar Int. = 300.1 ± 1.6
MSWD = 1.4

h.) Devine Canyon Tuff

Mean = 9.781 ± 0.022 Ma (9.718)
MSWD = 1.7
a.) A plagioclase plateau age of $16.72 \pm 0.21$ Ma (16.61) from lava pm10 at the Pueblo Mountains section. Grain size 63-105 um.

b.) Weighted mean age of $16.510 \pm 0.042$ Ma (16.404) from 10 single-grain sanidine step-heated ages from a rhyolite flow capping the Pueblo Mountains. The age and polarity places this lava in the first reversed chron after the Steens reversal.

Figure 12. $^{40}$Ar/$^{39}$Ar ages from Pueblo Mountains.
Figure 13. $^{40}\text{Ar}/^{39}\text{Ar}$ ages from the text have been displayed with their uncertainties for comparison to the geomagnetic polarity time scale of Gradstein et al. (2004). Both the ss02 and ss09 flows at Summit Springs are most likely to have erupted after the Steens reversal during the C5Cn.3n chron. At Pueblo Mountains the basalts (pm10) are likely to have erupted before the Steens reversal during the C5Cr chron while the capping rhyolite at Pueblo Mountains (pma) erupted during the next reverse chron (C5Cn.2r). Columbia River Basalt magnetostratigraphy is shown with the Steens Reversal placed at the top of the C5Cr chron. See text for further discussion. SS - Summit Springs, PM - Pueblo Mountains.