Specific yield of the unconfined system is about 0.10 to 0.20; transmissivity ranges from about 400 to 20,000 ft^2/d. Transmissivity of the intermediate sedimentary rock unit is about 500 ft^2/d and storage coefficient is 0.001; transmissivity of the lower volcanic unit ranges from 8,000 to 17,000 ft^2/d, and storage coefficient is 1×10^{-6}.

Underflow to the confined system as calculated by the model is about 100,000 to 200,000 acre-ft annually. Heads in the confined system are as much as 200 ft above land surface. Model simulation indicates vertical hydraulic conductivity is about 5×10^{-4} ft/d.

The model successfully simulated regional water-level changes except where faulting controlled ground-water movement or the geology was otherwise very complex.

DEPOSITIONAL ENVIRONMENTAL ANALYSIS OF THE KIRKMAN FORMATION, CENTRAL UTAH

No 72919

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The Kirkman Formation in the central Wasatch Mountains, Utah contains three units. The lowest unit of the Kirkman Formation is a thick bedded fossiliferous mudstone that is conformable on the Oquirrh Formation and weathers to form a cliff. It was deposited in a shallow marine environment following the deposition of the deep water sandstone to siltstone of the Oquirrh Formation. Unit two is a laminated mudstone that contains alternating light and dark bands. An absence of bioturbation and the presence of laminations suggests a low energy marine environment unsuitable for life. The upper unit of the Kirkman Formation is a lithic breccia to mudstone that contains clasts that were derived from unit two. These clasts may have formed in three ways: first, as rip up clasts during storms, second, as collapse features that developed on the surface following the retreat of the Kirkman sea and third, by tectonic deformation of the Kirkman Formation during the Sevier orogeny. The contact between the Kirkman Formation and the Diamond Creek Sandstone is conformable. It is placed at the sandstone above the lithic breccia of unit three. Tongues of the Kirkman Formation are present in the lower part of the Diamond Creek Sandstone. Deposition of the Diamond Creek Sandstone was in a beach to eolian environment. At every study location the Kirkman Formation was deformed by the Sevier orogeny.

METAMORPHIC STRATIGRAPHY ALONG SOUTH HARDSCRABBLE CREEK, WET MOUNTAINS, COLORADO

No 55531

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A sequence of over 3000 ft. of Proterozoic metamorphic strata is exposed north of South Hardscrabble Creek. Although rocks west of the nearby Ilse fault are tightly folded and faulted, these rocks are only slightly deformed. Most of the sequence comprises meta-sediments, with a paleo-channel indicating that the rocks are right-side up. The presence of a meta-gabbroic sill suggests a similar origin to rocks described from nearby in Salida and Gunnison.

The meta-sediments were divided for mapping purposes into eight predominantly red or blue units. The blue units are amphibolites (52% SiO_2) and biotite gneisses (67% SiO_2), with variable amounts of quartz, garnet and sillimanite. They are slightly migmatized. A retrograde sillimanite-microcline=quartz-muscovite reaction places this entire sequence in the upper-most amphibolite facies. The red units contain quartz and 2 feldspars, and average 76% SiO_2. They may be meta-arkoses, or less likely differentiated portions of an originally homogeneous sedimentary unit, or least likely, meta-igneous. Interbedded with them is one small flaser-bedded, sillimanitic quartzite. The two types usually wedge out into each other along sharp contacts, with minor small-scale interfingering.

A small sill of meta-gabbroic composition (tholeiite, 49% SiO_2) shows well preserved ophitic texture. A Zr-Ti plot puts it in the island arc tholeiite field, along with the gabbros from Salida. There are several lenses of porphyritic volcanics (67% SiO_2, 1457±30 m.y., M. E. Bickford) which intrude this sequence. The field work supports models of shallow water, limy shale-sandstone sedimentation in a tensional, possibly back-arc spreading or rifting environment.

PETROLOGY AND TECTONIC IMPLICATIONS OF OLIGOCENE SALMON CREEK VOLCANICS, SW IDAHO

No 62044

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The Salmon Creek volcanics (SCV) in the Reynold's Basin area, eastern Owyhee Mountains, comprise interlayered olivine basalt and xenocrystic basaltic andesite flows, thick beds of lapilli tuff and tuff breccia, and hornblende andesite dikes that cut the pyroclastic units and apparently fed a small number of upper flows. K-Ar dates on a basal flow and on a late dike bracket the age of this activity as 30.9 to 26.0±0.3 m.y. ago. Major and trace element analyses of a stratigraphically well-defined sequence of flows indicate several compositional cycles that are consistent with eruption of an evolving, periodically replenished magma body. Early crystallization of magnetite, later hornblende, and eruption of cinder lapilli suggest an oxidizing environment, and volatile saturation as a possible eruptive mechanism. Sr and Nd isotope ratios are close to bulk earth values. Variation of these ratios through the sequence is slight and consistent with a small amount of crustal contamination. Trace element systematics suggest a multistage model of partial melting in a mantle enriched by subduction, and evolution in a crustal magma chamber.

The SCV erupted during a fundamental tectonic transition in the northern Basin and Range as compressional orogenesis shifted to an extensional regime. N-trending folds, NE-trending hornblende andesite dikes, and NE-NW orientations of vertical dip-slip fault sets in the SCV imply a lateral shear couple. Locally tensile volumes in the crust would have encouraged the ascent of basaltic magma but not as efficiently as later Miocene extension. Most of the SCV lavas fit Gill's (1981) definition of orogenic andesites, implying Tertiary subduction beneath SW Idaho continued to at least as recently as 30 m.y. ago.

THE WAH WAH SPRINGS TUFF: COMPOSITIONAL VARIATIONS IN A DOMINANT VOLUME TUFF

No 48232

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The Wah Wah Springs Tuff Member of the Needles Range Formation was emplaced as a simple cooling unit about 30 mybp. The source of the tuff is the Indian Peak Caldera located near the southern Utah-Nevada border. The tuff is crystal-rich, calc-alkaline, and rhyodacitic to quartz latitic in bulk composition. Minimum volume estimates corrected for 80 km of Basin and Range extension indicate that the cooling unit is one of the largest currently recognized tuffs in the world (3300 km^3).

Observed bulk chemical trends for several trace elements are explained in terms of a model involving a variably zoned liquid within a preeruptive crystal-rich magma. Simple mixing of physical components during emplacement does not duplicate the observed trends for major elements and expected trends for LIL elements such as U and Th.

Preeruption, post-crystallization trends for elements plotted against magmatic temperatures indicate that U, Th and Ba were enriched roofward in the magma while Sr was depleted. Mass-balance calculations employing variable glass losses during emplacement suggest the above trends existed prior to the onset of crystallization.

Unlike many zoned tuffs, the conspicuous appearance, or disappearance of a mineral phase(s) does not occur within the Wah Wah Springs Tuff. Crystal size does not vary with stratigraphic position or lateral position at sites sampled radially surrounding the source. The outflow tuff contains early-crystallized apatite, zircon, and pyrrhotite followed by magnetite, ilmenite, andesine, hornblende, biotite, clinopyroxene and quartz.

STRATIGRAPHY AND ENVIRONMENT OF DEPOSITION OF A PHOSPHATIC UNIT AND ADJACENT ROCKS IN THE PENNSYLVANIAN LOWER MEMBER OF THE WELLS FORMATION

No 69442

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In southeastern Idaho a 0.5- to 1.0-m-thick peloidal phosphorite and phosphatic siltstone unit is located approximately 33 m below the top of the lower member of the Wells Formation (middle Pennsylvanian). A 0.6-m-thick interbedded wackestone and algally laminated boundstone underlies the phosphate horizon. Overlying the phosphatic unit are interbedded silty dolomites and cherty dolomitic siltstones that contain vugs filled with length-slow calcedony.

The phosphorite, phosphatic siltstone and adjacent rocks display characteristics of an intertidal to supratidal shallowing-upward sequence. The thinly laminated, foraminiferal, ostracodal wackestone, algal boundstone, and pelletal wackestone below the lower contact exhibit characteristics of a low-energy, restricted, intertidal depositional environment. The overlying interbedded peloidal phosphorite, laminated phosphatic mudstone and sparsely bioclastic siltstone probably formed in an intertidal depositional environment. Semirounded peloids with irregular banding may have formed in a higher-energy intertidal zone or in a gently sloping shoaling sequence offshore. Length-slow calcedony, dolomitization, intraclasts, hematite and abraded fossil debris all suggest a shallow-water depositional environment with fluctuating energy levels, periodic restricted circulation, and an increase in salinity and evaporation. The overlying dolomitic siltstones and silty, finely crystalline dolomites containing phosphatic lithoclasts and vugs filled with length-slow chalcedonly are interpreted as having formed in an upper intertidal to supratidal environment with restricted circulation and deposition of evaporites. Diagenetic replacement by chalcedony, chert, dolomite, and authigenic quartz is common throughout these rocks.