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DURATION OF SEDIMENTATION OF THE CREEDE FORMATION

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INTRODUCTION

$^{40}\text{Ar}/^{39}\text{Ar}$ age measurements were made on biotite and sanidine from the Snowshoe Mountain Tuff and the Fisher Dacite and on biotite from ash layers in the Creede Formation in order to determine the duration of sedimentation of the Creede Formation. Some of the ages are total-fusion measurements in which the mineral grains were melted using a continuous Ar laser (Dalrymple, 1989). The remainder are plateau ages from incremental-heating experiments (Lanphere, 1988).

RESULTS

Total-fusion $^{40}\text{Ar}/^{39}\text{Ar}$ ages were measured on biotite from five ash layers in the Creede Formation in the two moat holes. The biotite ages range from 26.13 ± 0.19 Ma to 27.10 ± 0.07 Ma and do not stack in correct stratigraphic order (Table 1). This probably means that the ash layers do not consist solely of primary material but contain reworked material as well. Thus, it seems unlikely that reliable ages for the Creede Formation can be measured directly.

The duration of sedimentation of the Creede Formation can be constrained by the ages of volcanic units that stratigraphically bracket the Creede Formation. These units are the Snowshoe Mountain Tuff and lava flows of Fisher Dacite. The Snowshoe Mountain Tuff underlies the Creede Formation in the core from moat hole 2 (CCM-2). Biotite and sanidine from sample 2R223 have total-fusion ages of 27.10 ± 0.12 Ma and 26.79 ± 0.09 Ma, respectively (Table 1). Biotite from outcrop samples of Snowshoe Mountain Tuff at Point of Rocks, Creede quadrangle, Lime Creek, Spat City quadrangle, and Cattle Mountain, Beaver Creek Reservoir quadrangle yielded $^{40}\text{Ar}/^{39}\text{Ar}$ plateau ages of 26.69 ± 0.16 Ma, 26.86 ± 0.12 Ma, and 27.08 ± 0.17 Ma, respectively (Table 1). The samples from Point of Rocks and Lime Creek are from the resurgent dome of the Creede caldera whereas the Cattle Mountain sample is from outflow ruff about 22 miles southeast of the resurgent dome.

Lava flows of Fisher Dacite occur below, within, and above the Creede Formation. The Fisher Dacite at Seepage Creek, Bristol Head quadrangle, is older than the Creede Formation, biotite from this locality yielded total-fusion and plateau ages of 26.63 ± 0.09 Ma and 26.97 ± 0.12 Ma, respectively (Table 1). The Fisher Dacite at Wagon Wheel Gap, Creede quadrangle, is both underlain and overlain by units of the Creede Formation. Biotite from this locality yielded total-fusion and plateau ages of 26.59 ± 0.09 Ma and 26.68 ± 0.14 Ma, respectively (Table 1). The Creede Formation crops out discontinuously in the moat of the Creede caldera south of the resurgent dome. The highest elevation outcrop of Creede Formation is overlain by the lava flow of Fisher

Mountain. Sanidine and biotite from Fisher Mountain and nearby Copper Mountain have total-fusion ages ranging from 26.20 ± 0.07 Ma to 26.30 ± 0.30 Ma (Table 1).

The older limit on the age of the Creede Formation is given by the age of the Snowshoe Mountain Tuff. Pooling all the measurements yields an age of 26.89 ± 0.05 Ma (Table 2). The younger limit is given by the age of the stratigraphically highest lavas of Fisher Dacite on Copper and Fisher Mountains. Pooling these ages yields an age of $26-23 \pm 0.05$ Ma (Table 2). These two limits give a maximum duration for sedimentation of the Creede Formation of 0.66 Ma. The time during which the Creede Formation accumulated could be somewhat shorter because there is a sequence of sedimentary deposits above the Snowshoe Mountain Tuff and below the Creede Formation. Also, there is no way to determine the interval of time between the end of Creede Formation sedimentation and eruption of Fisher Dacite lavas on Fisher and Copper Mountains.

REFERENCES

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- Lanphere, M.A., 1988, High-resolution $^{40}\text{Ar}/^{39}\text{Ar}$ chronology of Oligocene volcanic rocks, San Juan Mountains, Colorado: *Geochim. et Cosmochim. Acta*, v. 52, p. 1425-1434.

Table 1: $^{40}\text{Ar}/^{39}\text{Ar}$ ages relevant to the Creede Formation

	Age (Ma)		
	<i>Mineral</i>	<i>Laser total fusion</i>	<i>L. H. Plateau</i>
Fisher Dacite (Fisher Mtn)	Sanidine	26.30 ± 0.08	
Fisher Dacite (Copper Mtn)	Sanidine	26.20 ± 0.07	
Fisher Dacite (WW Gap)	Biotite	26.26 ± 0.10	26.68 ± 0.14
	Biotite	26.59 ± 0.09	
Creede Fm. (2R8)	Biotite	26.39 ± 0.16	
Creede Fm. (2R31)	Biotite	27.10 ± 0.07	
Creede Fm. (I F35)	Biotite	26.97 ± 0.10	
Creede Fm. (IR58)	Biotite	27.10 ± 0.07	
Creede Fm. (2RI25)	Biotite	26.13 ± 0.19	
Fisher Dacite (Seepage Cr)	Biotite	26.63 ± 0.09	26.97 ± 0.12
Snowshoe Mtn Tuff (2R223)	Sanidine	26.79 ± 0.09	
	Biotite	27.10 ± 0.12	
Snowshoe Mtn Tuff (Cattle Mtn)	Biotite	27.08 ± 0.17	
Snowshoe Mtn Tuff (Point of Rocks)	Biotite	26.69 ± 0.16	
Snowshoe Mtn Tuff (Lime Creek)	Biotite	26.86 ± 0.12	

Table 2: Duration of Creede Formation Sedimentation

Younger limit: Fisher Dacite (Copper and Fisher Mountains)	26.23 ± 0.05 Ma
Creede Formation	
Older limit: Snowshoe Mountain Tuff (all age measurements)	26.89 ± 0.05 Ma
Snowshoe Mountain Tuff (biotite ages only)	26.94 ± 0.07 Ma

Maximum duration of sedimentation 0.66Ma