ABSTRACT

TITLE:	Shear Sense of the Fall Creek Shear Zone, Vallecito Creek Area, La Plata County, Colorado
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ABSTRACT: A portion of the contact between the 1.8 Ga Irving Formation and the younger Vallecito Conglomerate, including the Fall Creek Conglomerate, is recognized as a fault (Gonzales, 1988). However, previous studies have found conflicting evidence for its shear sense: Gonzales (1988) found outcrop-scale evidence for west-side-up shear, whereas Zinsser (2006) found thin-section-scale evidence for east-side-up shear. In order to resolve these conflicting observations, a systematic field- and microscopic-scale study of shear sense along the two-mile-long exposure of the shear zone has been undertaken. The Irving Formation, a 1.8 Ga metabasalt, forms a significant part of the crystalline basement of the modern San Juan Mountains and represents the early arc accretion of the proto-continent Laurentia. The younger Vallecito Conglomerate and its local basal facies, the Fall Creek Conglomerate, are metaconglomerates interpreted to have been deposited after 1.7 Ga (Jones et al., 2008). The Vallecito Conglomerate lies in stratigraphic or fault contact with the Irving Formation in several outcrop locations, including the study area near Vallecito Creek and Fall Creek in La Plata County, Colorado. The basal facies of the Vallecito, the Fall Creek Conglomerate, is interpreted as a metamorphosed, short-fluvial-system deposit and makes up most of the sheared rock at this location (Gonzales, 1988). The shear zone is highly foliated along a nearly vertical, approximately north-south plane. Some foliation surfaces contain lineation from aligned minerals, also with a nearly vertical plunge. Within the Fall Creek Conglomerate, there is a gradational transition from the quartz-rich pebbles and cobbles of the Vallecito Conglomerate on the east side, into the mafic, fine-grained Irving Formation on the west. Outcrop and thin section analysis from this area has shown asymmetric clasts of quartz, epidote and hornblende indicating a shear sense of west-side-up relative movement, confirming the interpretation of Gonzales (1988). This shear sense is consistent with the interpreted structural relationship, in which the Fall Creek and Vallecito Conglomerates were deposited (unconformably) upon the Irving Formation and subsequent faulting elevated the older Irving above the younger conglomerates. The overall mineral assemblage includes primarily biotite, hornblende/actinolite, magnetite, epidote, chlorite, and quartz and reveals that the ductile movement took place under mid- to upper greenschist facies conditions. A range of elongate crystal orientations indicates that most of the shear zone deformed before the growth of these crystals, while other zones include hornblende and biotite oriented in the direction of foliation. There is no local evidence for reactivation of the shear zone at temperatures lower than middle greenschist facies.