RECENT GLASS STREWN FIELD FROM FIREBALL OVER CHILE

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Intense fireballs have been previously proposed to account for broad areas of melted soils, including 770-790 kyr Muong Nong tektites (Wasson, 2003), ~700 kyr Edowie glasses (Haines et al., 2001), <150 kyr Dakhleh glasses (Osinski et al., 2008), and the 26 myr Libyan Desert glasses (Bosolugh and Crawford, 2008). In those cases, it is difficult to identify clear evidence for a crater-forming ePvent, other than extreme temperatures and rarity (to general absence) of shocked minerals within the glasses. Without another reasonable explanation, such glass strewn fields have been attributed to thermal radiation from low-altitude bursts. Here, we report diagnostic evidence for fireball-generated glasses spread along a 70 km long zone on the Atacama Desert in northern Chile. First discovered and attributed to the effects of a bolide (Blanco and Tomlinson, 2013; Perroud *et al*., 2016), later efforts proposed that the glasses resulted from grass fires ((Roperch et al., 2017). New field work (Schultz et al., 2018) and micro-analyses (Harris et al., 2018) reveal zircons with different degrees of thermal decomposition (temperatures 1700°C - 2000°C), twisted/folded thick masses (dynamic emplacement), and ubiquitous meteoritic clasts and exogenous minerals entrained in the glasses (including extraterrestrial assemblages of troilite, pendlandite, buchwaldite, CAI fragments, and volatile-rich chondrules). The composition of the meteoritic component implicates formation by a volatile-rich primitive body, with underlying ^{14}C-dated soils dates less than 13,000 years ago. While there is no evidence for an associated crater, possible blow-out zones do occur. The distribution, thickness, cooling history, inferred thermal gradients, and modes of emplacement for these glasses (up to 30 cm across) provide a unique case study for testing models of the thermal radiation environment around low-altitude bursts (e.g., Boslough and Crawford, 2008; Svetsov, 2017), as well as crater-forming impacts (Svetsov, 2017). The geologic field evidence is consistent with the Boslough/Crawford model that invokes convection as well as radiation in order to melt surface soils. Further field studies and sample analyses would constrain the temperature distribution across the strewn field, provide estimates for the scale of the event, and establish the consequences (and future threat) of a weak asteroid or comet. Moreover, such micro-analysis should provide a new strategy for diagnostically identifying similar fireball-generated glasses elsewhere, in addition to geochemical signatures.

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