STEINHEIM BASIN IMPACT SPHERULES. E. Buchner[1] and M. Schmieder. Institut für Planetologie, Universität Stuttgart, Herdweg 51, 70174 Stuttgart, Germany. [1]E-mail: elmar.buchner@geologie.uni-stuttgart.de

Introduction: The 3.8 km Steinheim Basin [1] in SW Germany is a complex impact crater with central uplift thought to have formed simultaneously with the 24 km and 14.4 Ma Ries crater [2] by the impact of a double asteroid. The crater is hosted by a sequence of Triassic to Upper Jurassic sedimentary rocks [1]. The Steinheim Basin exhibits an almost primary crater morphology, intensely brecciated limestone blocks at the crater rim, and shatter cones in limestones of excellent quality. In addition, a fall-back breccia ('Primäre Beckenbrekzie') mainly composed of Middle and Upper Jurassic limestones, marls, and sandstones is known from drillings in the Steinheim Basin [1]. Recently, layers of melt-bearing impact breccias, denominated as Steinheim suevite [3], as well as Fe-Ni-Co sulfides that represent a possible meteoritic component in the melt particles [4], were reported.

Samples and observations: Spherule-bearing samples of Steinheim suevite were recovered from the B26 drill core (core depth 76-77 m) stored at the Meteorkratermuseum, Steinheim. Spherules (generally ~2-200 μm in size) were detected in the groundmass of the basin breccia, embedded in altered melt fragments, as well as adhered at the surface of altered melt particles. In the suevite, spherules are composed of essentially pure calcite, silica, feldspar, and mingled domains of recrystallized calcite and silicate glass. One spherule at the surface of an altered melt particle contained up to 2.4 wt% in Ni and up to 0.2 wt% in Co at a Ni/Co ratio of ~10:1 [4]. Magnetic and silicate spherules were previously discovered in Pleistocene or older sediments of two caves on the Swabian Alb plateau [5,6], within a short distance to the Steinheim Basin. These spherules contain Ni (up to 7.8 wt%) and Co (up to 0.6 wt%) with an average Ni/Co ratio of ~10:1; silicate spherules yielded a composition similar to the Steinheim suevite melt particles (~50 wt% SiO_2). The cave sediments also contain volcanic Ti-magnetite crystals [7] that stem from the ~17-11 Ma Urach volcanic field [8], indicating that the spherules and spinels were embedded into the cave sediments in the Miocene.

Conclusions: Whereas spherules composed of calcite, silica, or feldspar are likely derived from the Steinheim target rock, Fe-Ni-Co spherules on melt fragments probably originate from the Steinheim impactor. The geochemical signature of the Fe-Ni-Co and silicate spherules recovered from nearby cave sediments roughly corresponds to spherules in the Steinheim suevite. Silicate spherules compositionally resemble melt particles in the Steinheim suevite. The proximity of the caves to the Steinheim Basin, as well as the timing of Miocene ~17-11 Ma volcanism on the Swabian Alb recorded in the cave sediments, suggest that the spherules were produced by the ~14.4 Ma Steinheim impact.

References: [1] Reiff W. and Groschopf P. 1979. *Guidebook to the Steinheim Basin impact crater,* p. 9-18. [2] Stöffler D. et al. 2002. *Meteoritics & Planetary Science* 37:1893-1907. [3] Buchner E. and Schmieder M. 2009. This volume. [4] Schmieder M. and Buchner E. 2009. This volume. [5] Buchner E. et al. 2009. Abstract #1017. 40th Lunar and Planetary Science Conference. [6] Strasser M. et al. 2009. *Geomorphology* 106:130-141. [7] Papenfuss K.-H. 1974. *Jahreshefte des geologischen Landesamtes Baden-Württemberg* 16:13-34. [8] Ufrecht W. et al. 1990. *Jahresberichte und Mitteilungen des Oberrheinischen Geologischen Vereins* 72:359-390.