The Hradec Králové (CZ) and Renchen (DE) meteorite falls - recovery of meteorites exactly according to prediction based on records taken by the European Fireball Network

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Instrumental observations of fireballs, especially those associated with recovered meteorites, are of great scientific interest and importance because meteorites provide us with a surviving physical record of the formation of our solar system and a direct link to their parent bodies. We will present two new cases, which were observed by instruments of the European Fireball Network since the last Meteoroids conference.

The first bolide terminating by a meteorite fall occurred over the Czech Republic on May 17, 2016 at 1:04:01.2-7.3 UT. This bolide which reached -11.5 absolute magnitude was recorded photographically and photoelectrically by digital autonomous fireball observatories (DAFO) at three Czech stations of the European Fireball Network (other stations had unfortunately bad weather) and by two web cameras of the Czech Hydrometeorological Institute. Based on these instrumental data, results on atmospheric trajectory, heliocentric orbit, and fragmentation history were determined. It was evident that this event terminated with a multiple meteorite fall and the impact area of possible meteorite masses was modeled. However, a systematic search was very complicated because the fall occurred in an agriculturally cultivated area during the high vegetation season. After dedicated search activities of several teams and individual hunters, one freshly looking meteorite classified as LL5 ordinary chondrite named Hradec Králové was recovered by a private hunter in the predicted location for a given mass in the oil seed grape field just after the harvest on July 30, 2016.

The second bolide which terminated by a meteorite fall near the town of Renchen in Baden-Württemberg occurred over the westernmost part of Germany, close to the Rhine River near the borders of Germany and France on July 10, 2018 at 21:29:49-53 UT. In spite of a quite bad weather over whole Central Europe this bolide was recorded by instruments of the Czech and German parts of the European Fireball Network, from sites where it was at least partly clear at the time of its passage. Thanks to these records, this bolide, which reached -13.4 maximum absolute magnitude, could be reliably and accurately described. Apart from determination of its atmospheric trajectory and heliocentric orbit, we were able to predict that it ended with a multiple meteorite fall and describe the area where meteorites fell and how large they should be. We sent this information about the impact area to the German colleagues and they immediately started searching activities. As a result, altogether six meteorites classified as L5-6 ordinary chondrites and named Renchen with a total mass of 1229 g were found until now during dedicated searches exactly in the predicted locations for given meteorite mass. The first meteorite (12 g) was discovered two weeks after the fall. The largest meteorite fragment had a mass of 955 g and was found in a field close to a small impact pit. Two of the meteorites (5 and 6 g) were caught by a hail net covering a fruit plantation. The results describing atmospheric trajectories, heliocentric orbits, fragmentation history and predicted impact areas based on the analysis of the available records for both meteorite falls will be presented. Recovery of meteorites and their analysis will be also mentioned.

The number of meteorite falls with meteorites recovered on the basis of observation by the European Fireball Network has increased by four since the digitization of the Czech part of the network in the end of 2014.