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First multipoint ELF whistler detection by Swarm satellites

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It is known that lightning strikes generate broadband electromagnetic signals that propagate into the atmosphere and can reach into the ionosphere. Dispersion of the waves within the ionosphere separates the frequency content, generating whistler signals.
During the commissioning phase of the ESA Swarm mission, the three satellites provided unique observation conditions when they were initially following each other in orbit at a distance of few hundred kilometres. Several burst-mode sessions of the Absolute Scalar Magnetometers (ASM) were acquired between December 2013 and February 2014, when the sampling frequency was raised from the nominal 1 Hz to 250 Hz. Although this ELF frequency band is well below the ionosphere-atmosphere cutoff frequency, the ASM instruments were sensitive enough to clearly detect several hundred whistlers over a few dozen hours of operation, more than a hundred of which were detected simultaneously by at least two satellites. By correlating these simultaneously detected whistlers with ground-detected lightnings from the World Wide Lightning Location Network and EarthNetworks, we were able to observe for the first time the dependence with distance of the ELF whistler intensity at Swarm altitudes.