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The source of whistler emissions at the dayside magnetopause

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Observations of whistler emissions are common near the dayside magnetopause. We show that one of the major source regions for these emissions are magnetic field minima that form along magnetic flux tubes at high latitudes. Using multispacecraft Cluster observations we experimentally confirm for the first time the existence of the magnetic field minima at high latitudes and we show that whistler emissions propagate away from the magnetic field minima. The strongest whistler emissions are observed on the magnetospheric flux tubes that are newly opened due to the magnetic reconnection. These flux tubes still have a density of magnetospheric plasma but part of the high energy magnetospheric electrons have already been lost from the flux tubes. The partial loss of high energy electrons most probably causes anisotropy in electron distributions at high energies which should be the source of whistler emissions. Whistler emissions on opened flux tubes disappear as soon as the plasma density of flux tubes increase due to the entering of magnetosheath ions. We speculate that whistler emissions can be most probably used to trace the dynamics of the first opened field lines and thus the dynamics of magnetic reconnection sites.