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## PMWE creation mechanism inferred from sounding rocket measurements

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A first sounding rocket campaign dedicated to investigate the creation mechanism of Polar Mesosphere Winter Echoes (PMWE) was conducted in April 2018 from the north Norwegian Andøya Space Center (69°N, 16°E). Two instrumented sounding rockets were launched on 13th and 18th of April under PMWE and no-PMWE conditions, respectively.

In this paper we give a brief summary of our current knowledge of PMWE and an overview of the PMWE sounding rocket mission. We describe and discuss some results of combined in situ and ground-based measurements which allow to check the existing PMWE theories.

Our measurements clearly show that the coherent structures in refractive index variations (forming PMWE) are accompanied by neutral air turbulence, which is reflected in small-scale structures (down to some meters) of neutral and electron density. We show that the behavior of the structures under investigation together with the atmospheric background is consistent with the interpretation, that PMWE were created by turbulence. Rocket measurements ultimately show that polar winter mesosphere is abounded with meteor smoke particles (MSP) and intermittent turbulent layers. Furthermore, it becomes clear that charged Meteor Smoke Particles (MSP) and background electron density can only enhance SNR, while turbulence is a prerequisite for their formation.

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