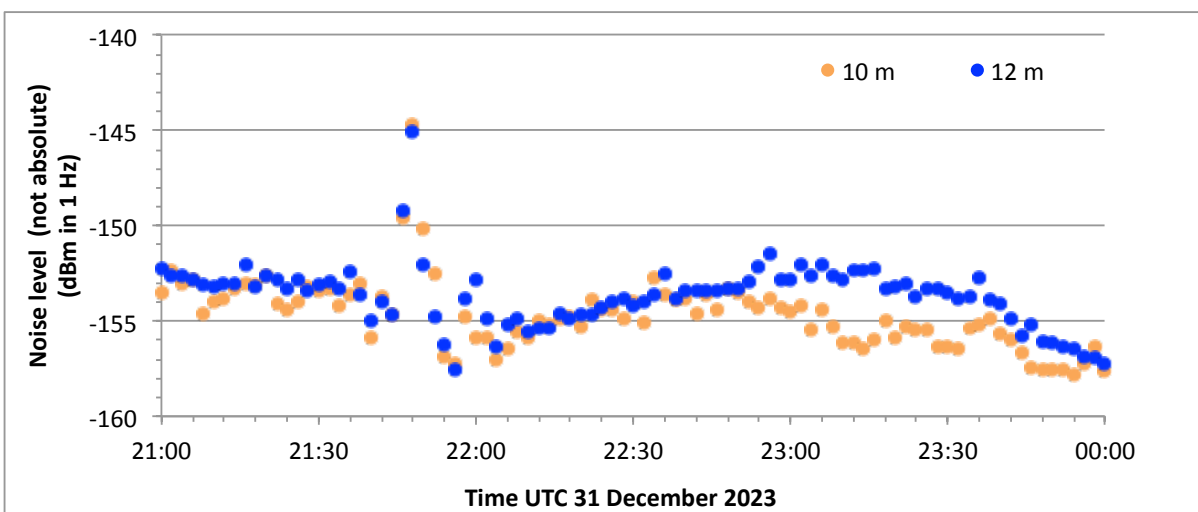
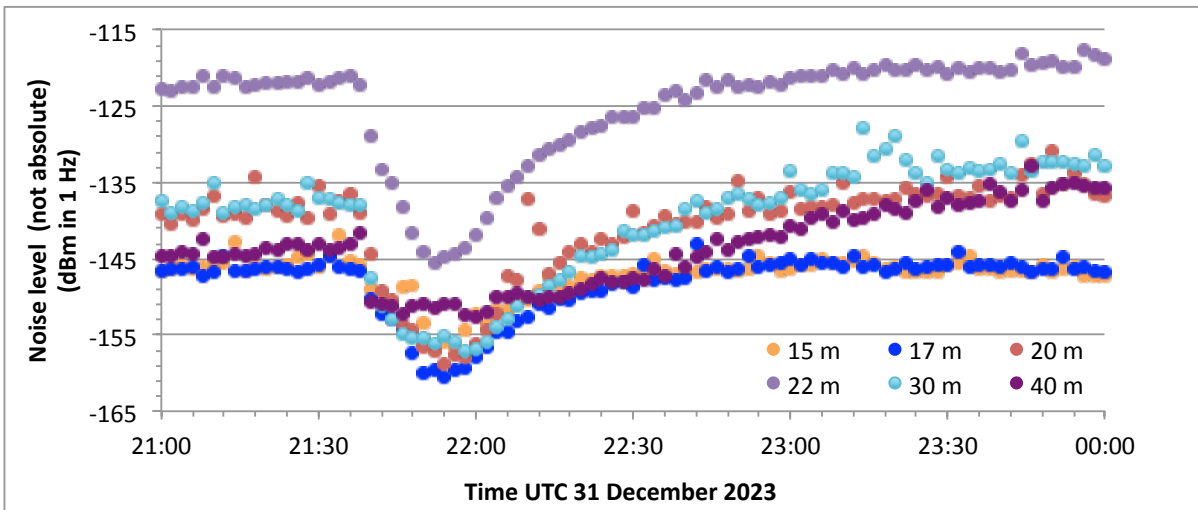


## 31 December 2023 X5.0 flare: Excess Absorption and Solar Noise Burst

The 31 December 2023 X5.0 flare was the largest observed since the X8.2 flare of 10 September 2017<sup>1</sup>. The extreme UV radiation from the flare resulted in additional (excess) ionisation in the D region leading to increased absorption. The time of the flare's peak, 21:52 to 21:55 UTC, meant the ionosphere over North America was particularly affected. At WsprDaemon sites limited by propagated-in noise excess daytime absorption can be seen as a noise level reduction. Here we see the noise level on 40-15 m (including 22 m) from KA7OEI-1, the Northern Utah SDR site. A reduction in noise began to be detectable at 20:40 UTC, peak at around 21:53 UTC

At KA7OEI-1 on 12 m and 10 m the noise is primarily local, there's little sign of excess absorption of propagated in noise. However, what we do see is a solar radio noise burst. Peaking at 21:48 UTC this was a shorter-lived, and sharper event - more like an impulse, with a peak 10 dB rise in noise level. The absorption curves, in contrast, are a combination of the extreme UV event and the response of the ionosphere. The asymmetry of fall and decline being due to a short time constant for ionisation - the fall - and a longer time constant for the recombination of electrons and ions - the rise.



**Acknowledgment:** Noise level measurements using WsprDaemon from Rob AI6VN. KA7OEI-1 data courtesy Clint Turner.

Gwyn Griffiths G3ZIL April 2024 V1.1

<sup>1</sup> <https://www.swpc.noaa.gov/news/x50-flare-closes-out-2023-year>