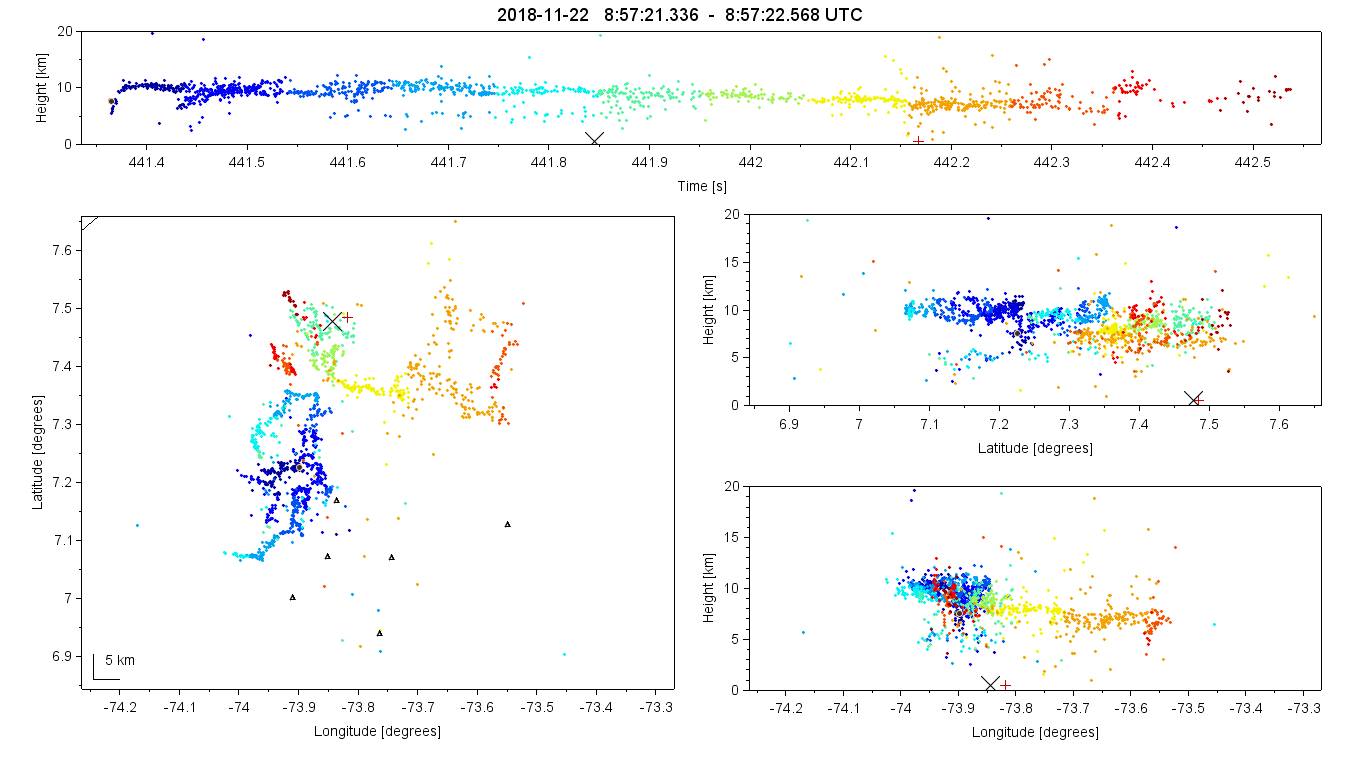
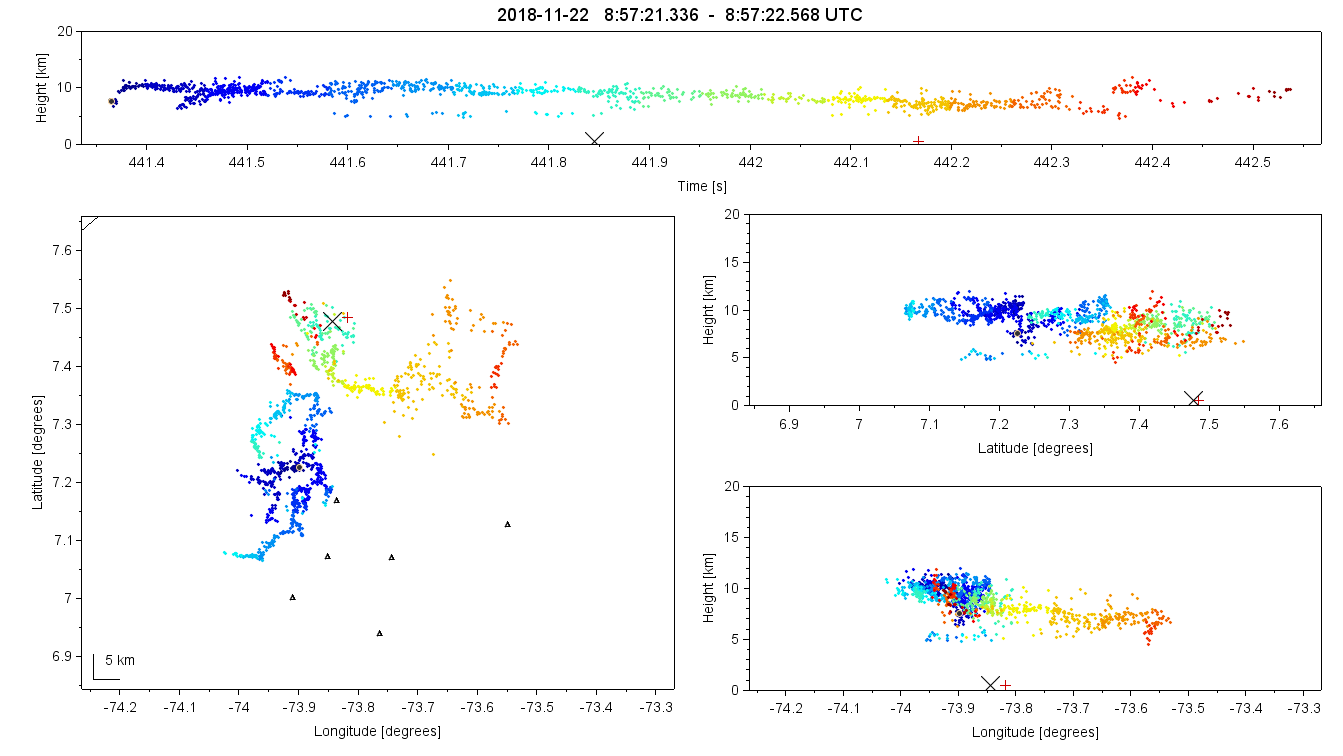
**LMA unfiltered and filtered data including the stations**



**Figure D.1** Unfiltered LMA data of the flash on 22 November 2018 at 08:57:21.4413 UT. The top panel is altitude of LMA sources versus time (seconds); the left panel is a plan view map; the panels at the right show altitude (km) by latitude and longitude. LMA sources are colored by time. LINET cloud-to-ground strokes (red symbols:  negative, + positive). LMA stations ().



**Figure D.2** Same as D.1 but a filter to the LMA data has applied. The filter eliminates VHF sources classified as noise, the method is described van der Velde and Montanyà (2013).



**Figure D.3** Time-distance graph of sources of the investigated flash. The reference location for the distance (t=0 s) is the negative cloud-to-ground stroke (-CG). The black dash-dotted reference lines indicate slopes corresponding to speeds of 2·104 m s-1, 105 m s-1, and 106 m s-1. Marker 1 indicates the initiation of and fast negative leader just after the positive cloud-to-ground stroke (+CG). The leader propagates at fast speed (0.4 10-6 m s-1) for 30 ms until marker 2. Refer to *van der* *Velde and Montanyà* (2013) for further explanation and interpretation of the time-distance graph.

**Optical depth**

The method is described in the Appendix of the paper.

|  |  |  |  |
| --- | --- | --- | --- |
| **Box** | **Mean Free path** (m) | **Absolute optical depth** | **Relative mean free path** |
| 1 | 1.852 | 1079.5 | 1 |
| 2 | 3.387 | 590.4 | 0.5 |
| 3 | 0.977 | 2046.3 | 1.9 |
| 4 | 2.007 | 996.1 | 0.9 |
| 5 | 2.101 | 951.7 | 0.88 |