

**SPACE WEATHER INSTRUMENTATION
FOR SPACE WEATHER SERVICES
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**Finnish Satellite Workshop 2018
17-18 January 2018, Dipoli, Otaniemi**

SPACE WEATHER SERVICES
SUPPORT

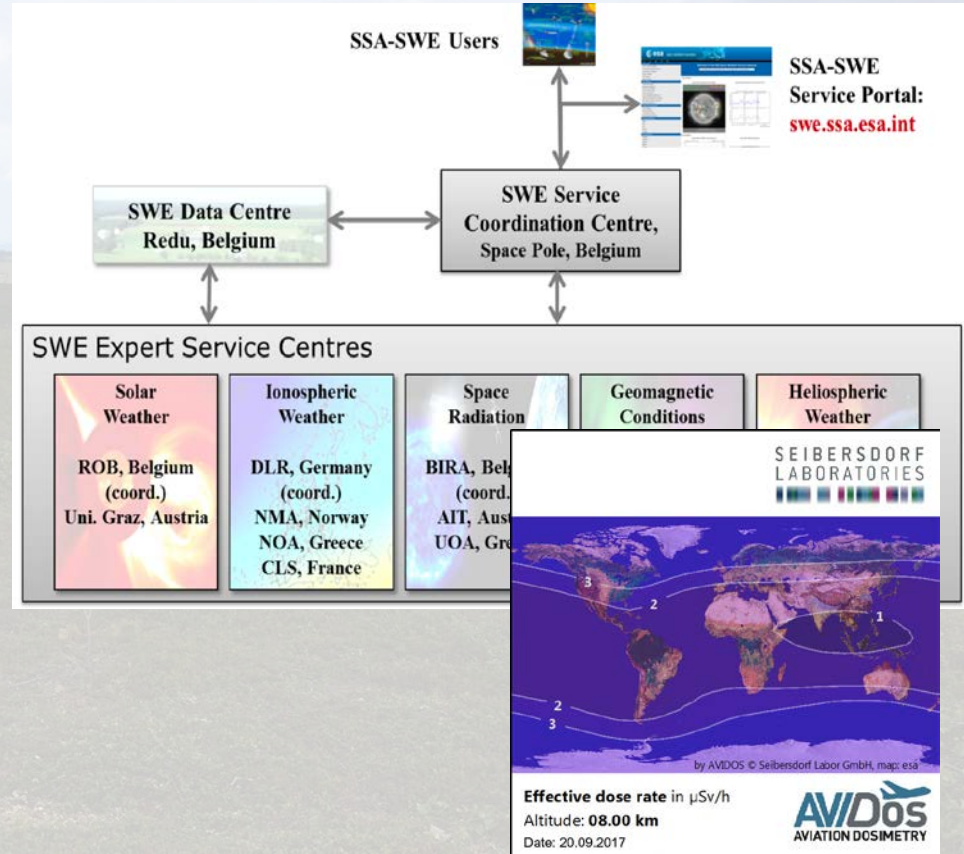
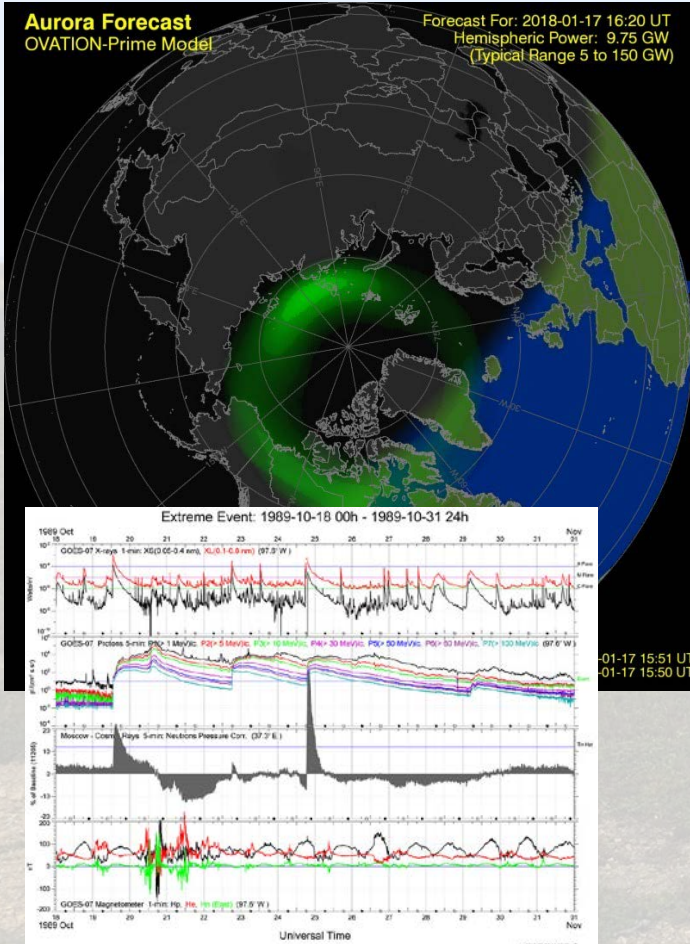
THE PROTECTION OF HUMAN ACTIVITIES AGAINST THE ADVERSE EFFECTS
OF SPACE WEATHER

IN **SPACE**, IN THE **AIR**, AND ON THE **GROUND**

EXISTING SWE SERVICES

USA/NOAA: <http://www.swpc.noaa.gov>

ESA: General : <http://swe.ssa.esa.int/>
 Aviation: http://swe.ssa.esa.int/nso_air



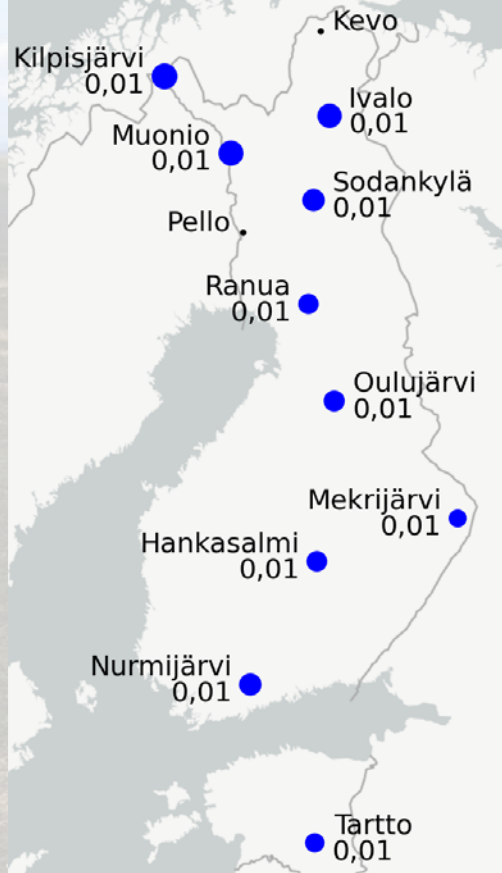
SWE SERVICE IN FINLAND

FMI:

<http://ilmatieteenlaitos.fi/revontulet-ja-avaruussaa>

<http://ilmatieteenlaitos.fi/avaruussaan-vaikutuksia>

17.01.2018 18:00 - 18:10



**SPACE WEATHER INSTRUMENTS ARE INTERESTING FOR
DEVELOPERS**

SINCE

**THERE ARE A NUMBER OF PROGRAMMES AND PROJECTS IN THE WORLD
FOR DEVELOPING**

NEW AND BETTER

SPACE WEATHER SERVICES

(explanation to come ...)

WE NEED MANY DIFFERENT KINDS OF INSTRUMENTS TO
MODEL, MONITOR AND FORECAST SPACE WEATHER

REASON

SPACE WEATHER CHAIN



SOME PRELIMINARY RESULTS OF OUR STUDY

**(PROJECT "MSW Service" IN ESA BUSINESS
APPLICATIONS PROGRAMME; Together with ANS Finland,
FMI, Reaktor Innovations, and Vaisala)**

COMMERCIALY VIABLE USE CASES OF SWE SERVICES

REQUIRE

HIGHER RESOLUTION MAPS AND FORECASTS OF

- ✓ RADIATION EXPOSURE/DOSE
- ✓ LONG RANGE RF SIGNAL DISTURBANCES
- ✓ GNSS SIGNAL DISTURBANCES

THAN PRESENT SERVICES CAN PROVIDE

IMPROVEMENTS

ARE NEEDED IN

SPACE WEATHER

- ✓ **MODELS**
- ✓ **INSTRUMENTS**
- ✓ **MEASUREMENT SYSTEM**

**BEFORE SWE SERVICES CAN BECOME PROFITABLE
BUSINESS**

**SPACE WEATHER INSTRUMENT
DEVELOPMENT ACTIVITIES**

X-RAY FLUX MONITOR FOR CUBESATS (XFM-CS)

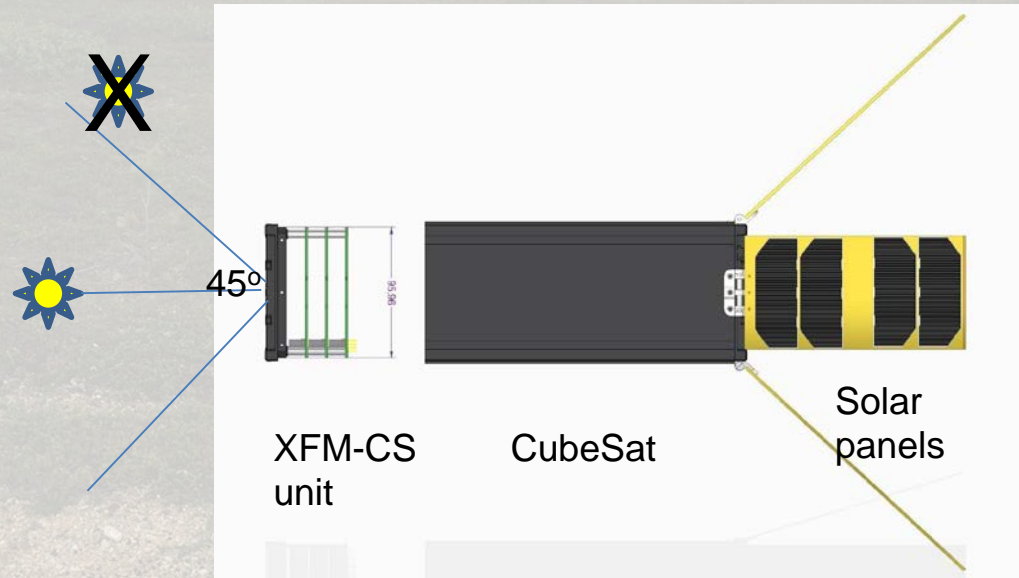
ESA GSTP PROGRAMME

GOAL: XFM unit to be flown on a CubeSat for In-Orbit Demonstration (IOD) with fast schedule (18 months) to FM

Together with ASRO, Oxford Instruments Technologies, and Talvioja Consulting

Plan: CubeSat from RSL

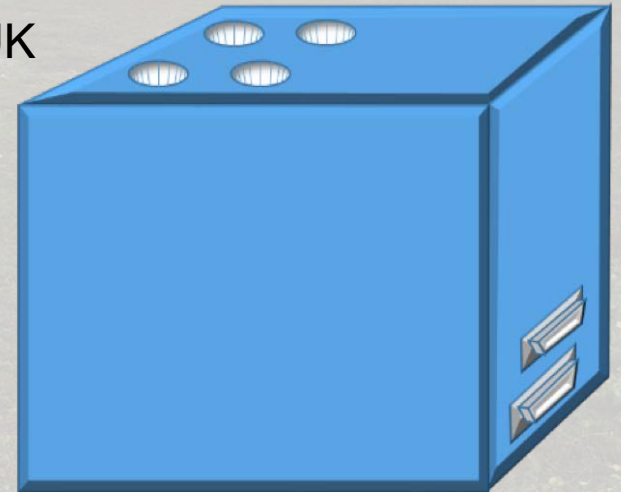
→ Fully domestic Space product



X-RAY FLUX MONITOR FOR THE ESA LAGRANGE MISSION TO L5

ESA SSA PROGRAMME

- International consortium led by UCL (MSSL), UK
- 5 instruments
- Phase A and B1 study



COMMERCIAL PROSPECTS FOR XFM

- ✓ **INTERESTED CUSTOMERS EXIST ALREADY FOR XFM**
- ✓ **TOGETHER WITH RADMON, A POTENTIAL COMPONENT FOR CS-BASED NEW ELEMENT IN FUTURE OPERATIONAL SPACE WEATHER OBSERVATION SYSTEM**
 - **Solution to the resolution problem of SWE forecasts ?**
- ✓ **ALSO POSSIBLE TO DEVELOP A VERSION FOR USE IN ELEMENTAL COMPOSITION ANALYSIS OF ASTEROIDS (FOR MINING)**
- ✓ **XFM-CS AND XFM-L5 HAVE DIFFERENT MARKET**

isaware

THANKS !