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Swiss Confederation

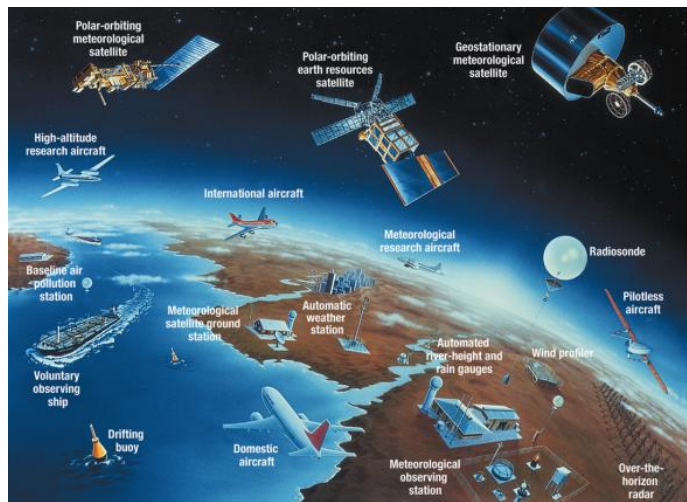
Federal Department of Home Affairs FDHA
Federal Office of Meteorology and Climatology MeteoSwiss

Radio-frequency use at MeteoSwiss

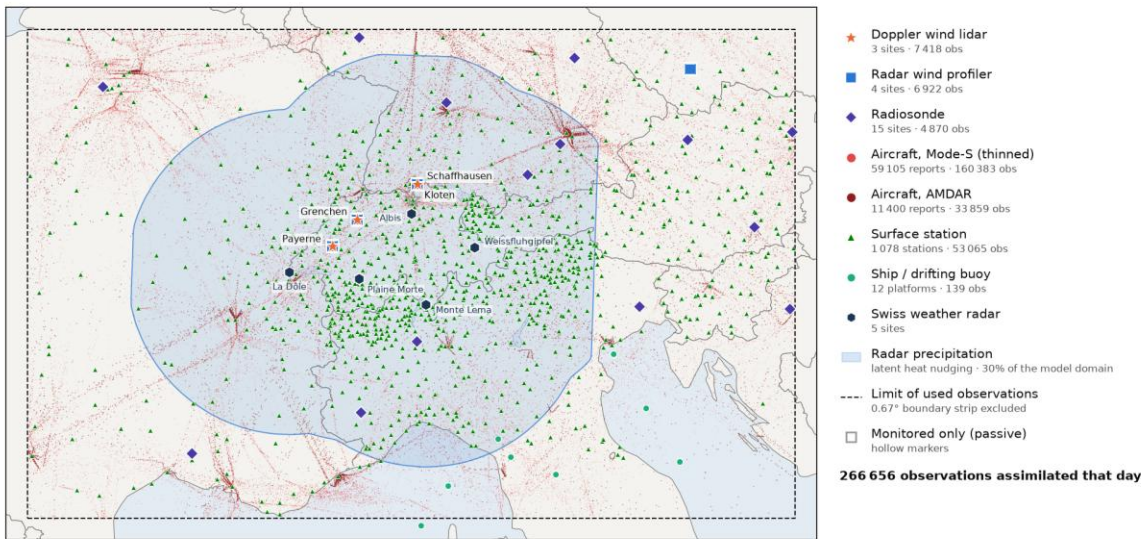
Maxime Hervo, ITU-WMO workshop



Observations assimilated at MeteoSwiss



Observations assimilated by KENDA-CH1 · 24 September 2026

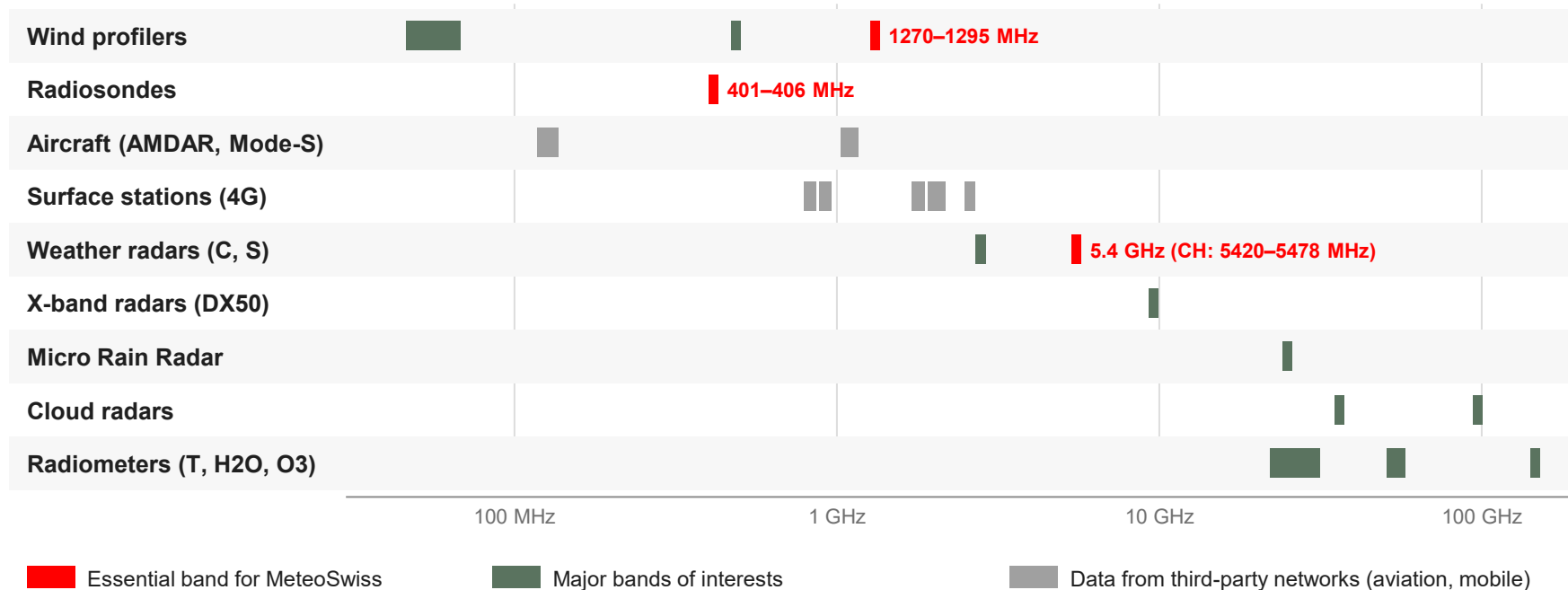


Source: KENDA-CH1 LETKF feedback files (ekt*.nc, state = active), all 24 hourly cycles, CSCS baifrin; radar footprint from the radardata grid of the 2026-09-24 12 UTC cycle.

- Global Observing system
- Weather has no borders, we rely on observations shared by our partners



Spectrum overview





Weather radars

S-BAND

2700–2900 MHz

Used by Spain, France, ... In CH: aeronautical surveillance radars only

C-BAND · ESSENTIAL BAND

5350–5725 MHz

Weather radars RIR0703-01. Swiss FAP reserves 5420–5478 MHz for Swiss ground-based weather radars (in use: 5430–5468 MHz)

C-band detail

5 Swiss radars

CH range 5420–5478 MHz



RLAN (5470–5725 MHz, secondary, DFS) overlaps the top 8 MHz of the Swiss range. 5600–5650 MHz is the preferred weather-radar band in Europe.



Position in the spectrum (log scale)

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Swiss weather radar network



La Dôle
5430 MHz



Weissfluhgipfel
5433 MHz



Albis
5450 MHz



Monte Lema
5455 MHz



Plaine Morte
5468 MHz

All five within 5420–5478 MHz (Swiss FAP)

Min. spacing 3 MHz

Photos: © MeteoSwiss



Radiosondes

RADIOSONDES · ESSENTIAL BAND

401–406 MHz

- Vaisala RS41, twice daily from Payerne (since 1942)
- Swiss FAP: Meteorological Aids primary; sondes under RIR0702-01/-02
- Shared with Armasuisse, universities and medical implants (ULP-AMI, secondary)
- **OFCOM expects 400.15–401 MHz to go to satellite services: 401–406 MHz must stay protected**



Payerne aerological station



Position in the spectrum (log scale)

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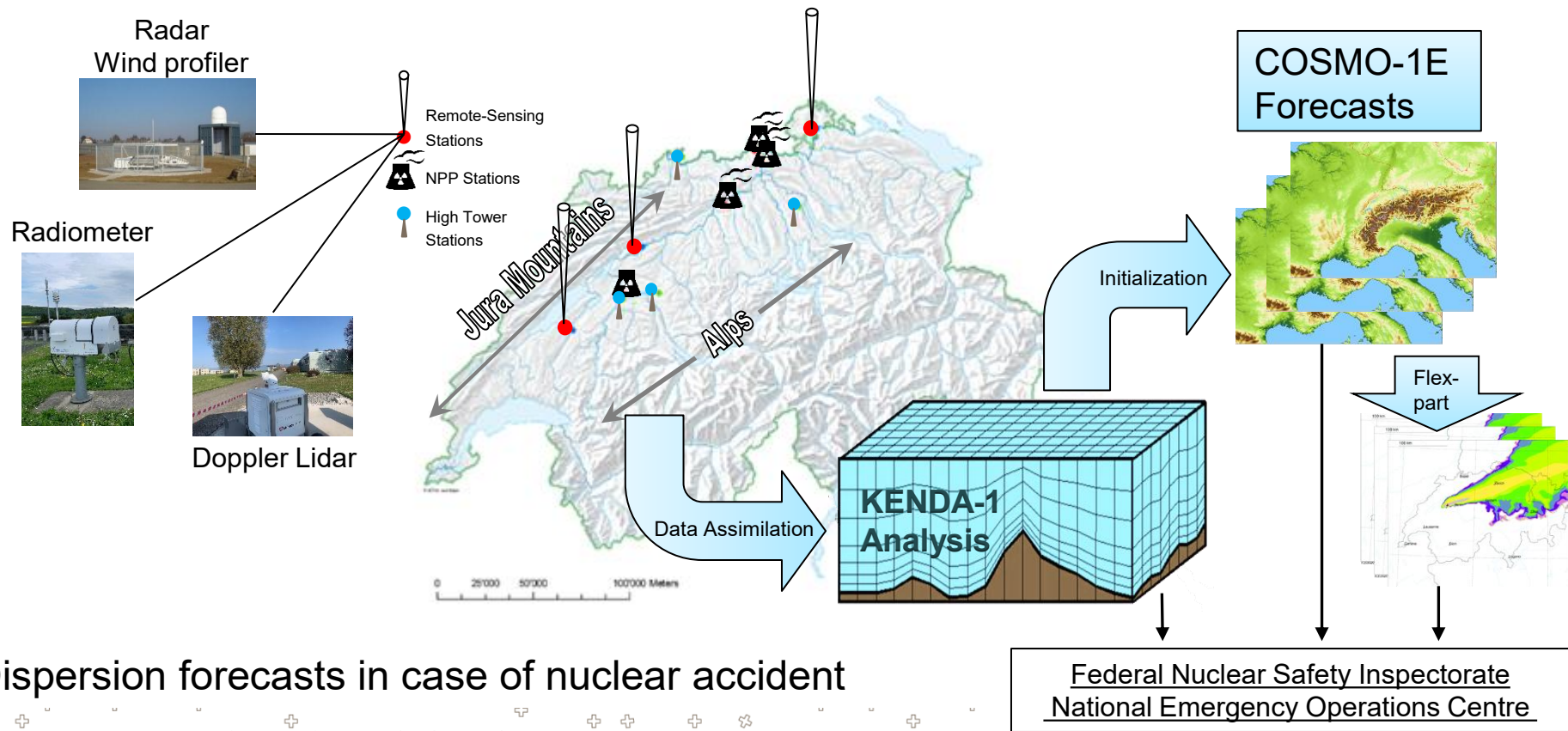
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EMER-Met : Emergency meteorology





Wind profilers

VHF

46–68 MHz

Used by France and the UK

Possible future use by MeteoSwiss

Swiss FAP: Land mobile primary (military); geographical sharing with wind profilers (RR 5.162A)

UHF

470–494 MHz

Used only by Germany

Possible future use by MeteoSwiss

Swiss FAP: Broadcasting (DVB-T) primary; wind-profiler sharing (RR 5.291A); band on the WRC-31 agenda

L-BAND · MAIN BAND

1270–1295 MHz

3 wind profilers operated by MeteoSwiss

Essential band

Swiss FAP: Wind profilers RIR0705-01 (ITU Res. 217); shared with radiolocation and Galileo (RNSS)



Position in the spectrum (log scale)

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Microwave radiometers

K-BAND

22–31 GHz

Water-vapour line (22.235 GHz) and liquid-water window: humidity profile, IWV, LWP

V-BAND

51–58 GHz

Flank of the O₂ absorption complex: temperature profile

OZONE

142 GHz

Ozone line (142.175 GHz): stratospheric ozone profile at Payerne and Bern

Not protected on an international basis

Passive only (no emission)

Only 23.6–24.0, 31.3–31.5 and 52.6–54.25 GHz are 'all emissions prohibited' in the Swiss FAP; other channels share with fixed, mobile and satellite services.



Position in the spectrum (log scale)

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Radiometers: international efforts



Report ITU-R RS.2489 describes ground-based radiometers for the first time

2021

Report ITU-R RS.2489-0

Technical and operational characteristics of ground-based passive sensors in 51–58 GHz. Effort led by Switzerland and France.

2025

Report ITU-R RS.2489-1

Extended to 22–32 GHz: 14 channels (22.24–31.4 and 51.26–58.0 GHz). Cites the Swiss EMER-Met network (3 sites since 2010, >95 % availability).

Status

Still no protection

The report states that radiometers operate “on an opportunistic basis... without any protection”. Only channels inside RR 5.340 passive bands are indirectly protected.

Next

On going developments

EUMETNET E-PROFILE MWR network

WRC-27 · potential issue for ground-based radiometers

- AI 1.1: aeronautical & maritime ESIMs in 50.4–51.4 GHz → contains 51.26 GHz
- AI 1.3: NGSO FSS gateways in 51.4–52.4 GHz → contains the 52.28 GHz channel



Position in the spectrum (log scale)

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Aircraft: AMDAR and Mode-S

VHF · AERONAUTICAL MOBILE (R)

AMDAR 117.975–137 MHz

- Temperature and wind (some aircraft: humidity) reported by commercial aircraft
- Downlinked via ACARS / VDL on VHF air-ground datalink (or SATCOM)

Swiss FAP: Aeronautical mobile primary, CIV/MIL (RIR0101-xx)

UHF · SSR / MODE-S

Mode-S EHS / MRAR 1030 / 1090 MHz

- Radar interrogates at 1030 MHz, aircraft reply at 1090 MHz
- Wind and temperature derived from aircraft heading, airspeed and ground track

Swiss FAP: Aeronautical radionavigation, SSR (RIR0103-05/-06); 1090 MHz also ADS-B

Aeronautical safety-of-life bands, well protected; MeteoSwiss is a data user, not the licensee.



Position in the spectrum (log scale)

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X-band radar: DX50

X-BAND

9300–9500 MHz

Main X-band weather-radar range (X-band: 9 100–9 700 MHz, ITU/WMO Handbook)

Swiss FAP: radiolocation / radionavigation / EESS (active), shared with maritime, airborne weather, bird-migration and ASDE radars. No specific RIR for ground-based weather radars.

DX50

Leonardo (Gematronik) METEOR 50DX

- Mobile, trailer-mounted dual-polarisation Doppler radar
- Magnetron transmitter, nominal ~9.4 GHz
- Used by MeteoSwiss in field campaigns, e.g. PaRaDIsco

X-band: sensitive to light precipitation and snow, compact and mobile, but strongly attenuated in heavy rain (Handbook § 4.2).



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Micro Rain Radar



MICRO RAIN RADAR

24

GHz

24.05–24.25 GHz (K-band)

Status

Operational at Payerne; also operated by EPFZ (ETH Zürich) and EPFL

Swiss FAP

Micro-rain radar under RIR0703-02 (radiolocation primary), in the 24.00–24.25 GHz ISM band shared with SRDs and automotive radars

Reference

ECC Report 166



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Cloud radars



KA-BAND

35 GHz

- MIRA radar
- Installed at Kloten airport for measurement campaigns

Swiss FAP: Cloud radar under RIR0703-03 (33.4–35.2 GHz)

W-BAND

94 GHz

- Operational at Payerne (ACTRIS, operated by the University of Bern)
- Also operated by EPFL

Swiss FAP: No specific RIR; 94.0–94.1 GHz radiolocation / EESS (active); temporary concession

Reference: ECC Report 166 (both bands)



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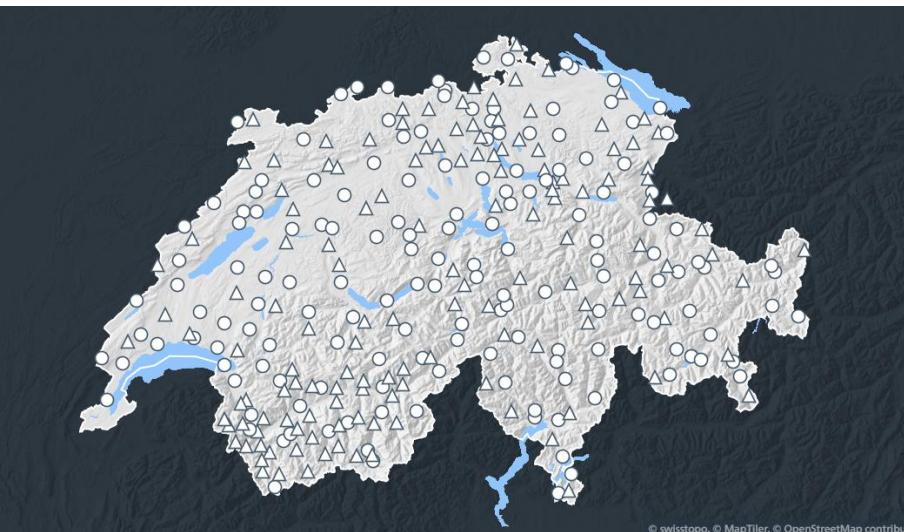
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Surface land observations



- >300 weathers stations
- Rely on 4G connections



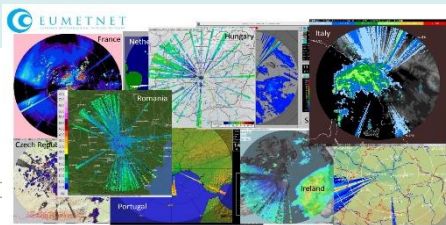
Conclusions

Fragile bands: we rely on strong and efficient collaboration with OFCOM and international partners

FRAGILE BANDS

Spectrum is critical

- Essential: 401–406 MHz, 1270–1295 MHz, 5420–5478 MHz
- Radiometers: no legal protection
- Once a band is lost, it is nearly impossible to recover



NATIONAL

OFCOM

- Strong and efficient long-term partnership
- MeteoSwiss relies on OFCOM expertise and resources

INTERNATIONAL

Partners

- WMO (ET-RFC)
- EUMETNET EUMETFREQ, EUMETSAT, ESA



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Summary: bands to monitor

Frequency	Type	Comment	Swiss FAP (OFCOM)
46–68 MHz	Wind profilers	France and UK; possible future use	Land mobile; WP sharing (RR 5.162A)
117.975–137 MHz	Aircraft (AMDAR)	ACARS / VDL datalink	Aeronautical mobile (R)
401–406 MHz	Radiosondes	Essential band	Met. Aids primary; RIR0702-01/-02
470–494 MHz	Wind profilers	Germany only; possible future use	Broadcasting; WP sharing (RR 5.291A)
1030 / 1090 MHz	Aircraft (Mode-S)	SSR interrogation / reply	SSR RIR0103-05/-06
1270–1295 MHz	Wind profilers	Main band; 3 MeteoSwiss profilers	RIR0705-01
2700–2900 MHz	Weather radars	Spain, France, ...	Aeronautical radionavigation
5350–5725 MHz	Weather radars	Swiss radars at 5430–5468 MHz	RIR0703-01; CH radars 5420–5478 MHz
24 GHz	Micro Rain Radar	Operational at Payerne; EPFZ, EPFL	RIR0703-02
35 GHz	Cloud radar	MIRA, Kloten airport (campaigns)	RIR0703-03 (33.4–35.2 GHz)
94 GHz	Cloud radar	Operational at Payerne (ACTRIS); EPFL	No specific RIR
22–31, 51–58, 142 GHz	Radiometers	No legal protection	Passive sub-bands only