Infrasound Broadband Bulletin Products of the IMS for Atmospheric Studies and Civilian Applications

Patrick Hupe[1], Lars Ceranna[1], Alexis Le Pichon[2], Robin S. Matoza[3], Pierrick Mialle[4]

[1] BGR, B4.3, Hannover, Germany
[2] CEA, DAM, DIF, F-91297 Arpajon, France
[3] Department of Earth Science and Earth Research Institute, University of California, Santa Barbara, CA, USA
[4] CTBTO, IDC, Vienna, Austria

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Abstract | Assets | Discussion | Metrics

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International Monitoring System infrasound data products for atmospheric studies and civilian applications

Patrick Hupe[1], Lars Ceranna[1], Alexis Le Pichon[2], Robin S. Matoza[3], and Pierrick Mialle[4]
[1]BGR, B4.3, D-30655 Hannover, Germany
[2]CEA, DAM, DIF, F-91297 Arpajon, France
[3]Department of Earth Science and Earth Research Institute, University of California, Santa Barbara, CA, USA
[4]CTBTO, IDC, Vienna, Austria

Discussion paper in
Earth System Science Data:

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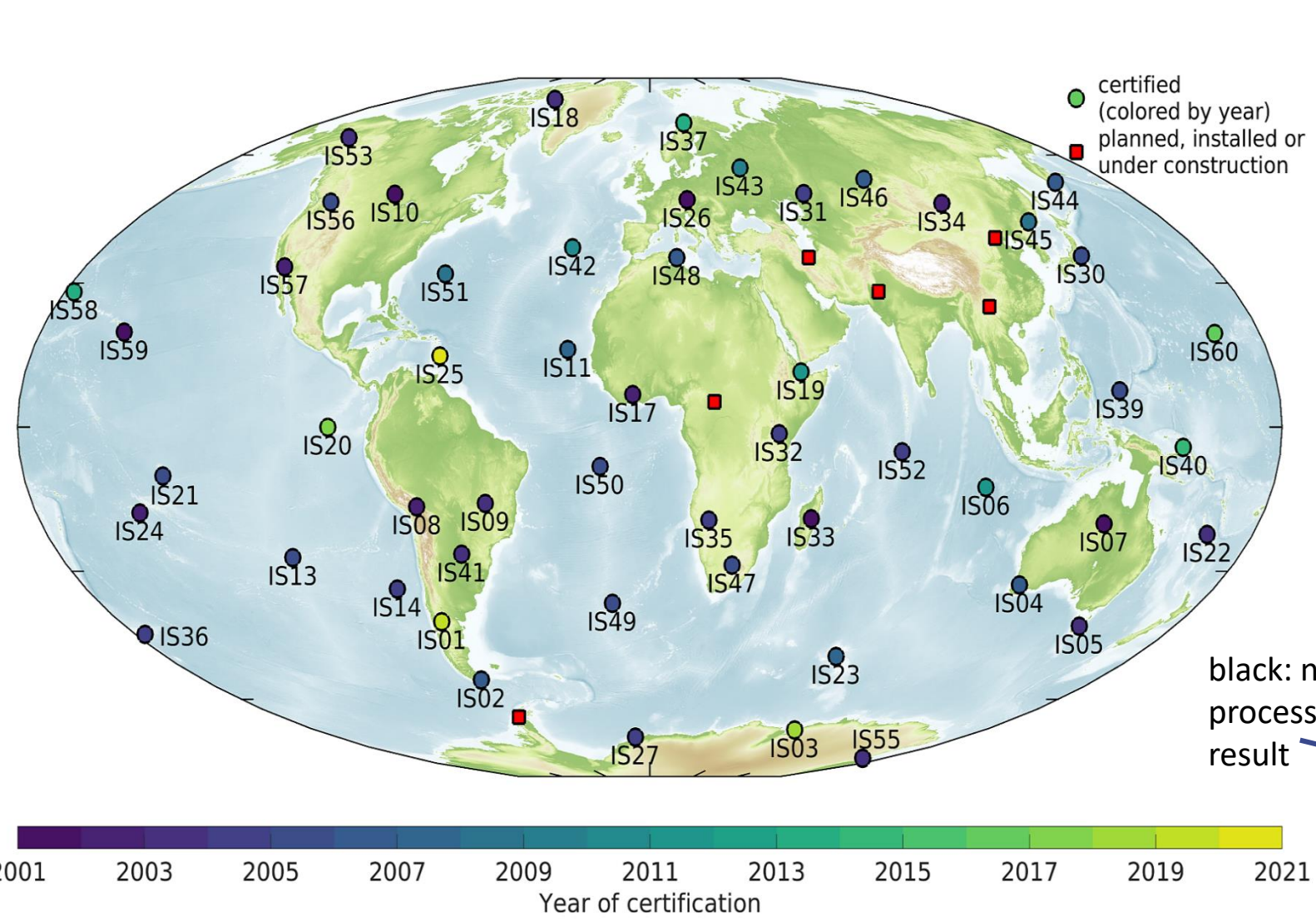
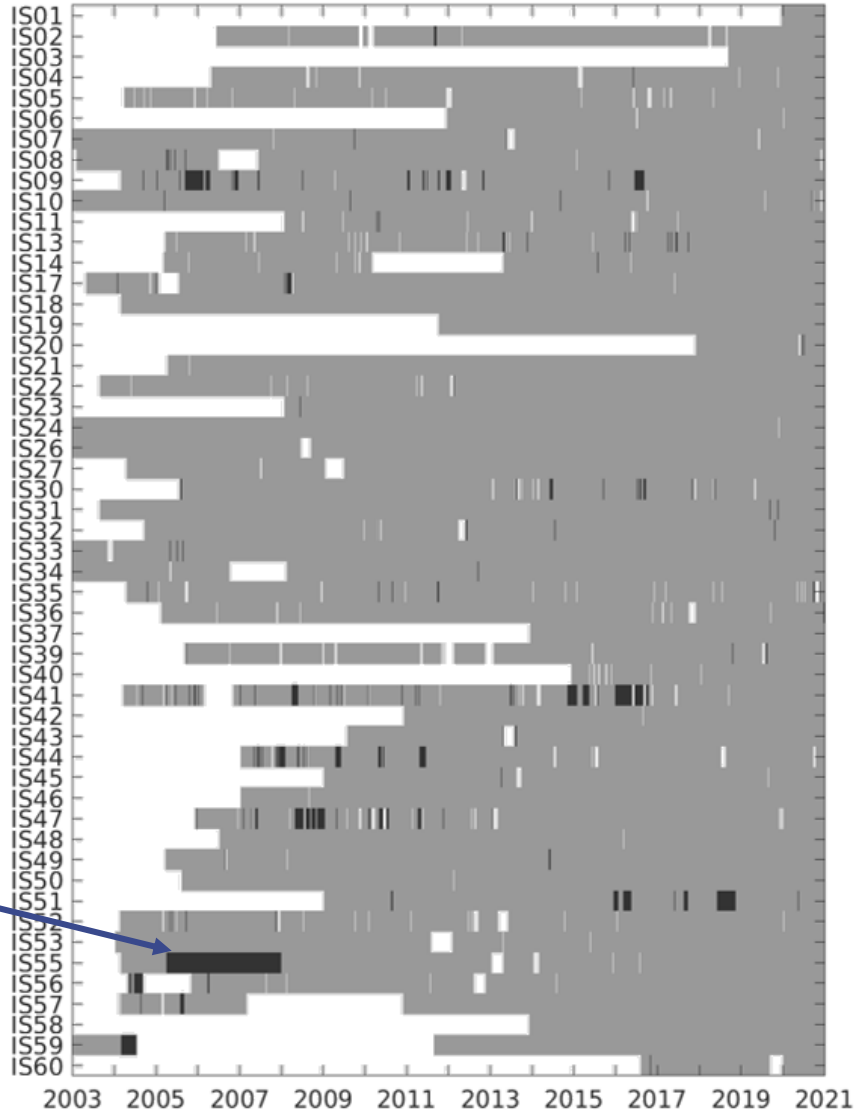
Tailored open-access data products of infrasound detection lists

- The IDC in Vienna routinely processes IMS infrasound data using the Progressive Multi-Channel Correlation (PMCC; Cansi, 1995) method.
- First systematic broadband (0.01-0.5 Hz) analysis of IMS infrasound data by Matoza et al. (2013).
- The full and increasing IMS infrasound data set is regularly reprocessed at the German National Data Center at the BGR (Ceranna et al., 2019).
- **Surplus of IMS data for atmospheric studies and natural hazards applications** (e.g., Blanc et al., 2018; Le Pichon et al., 2019), e.g. for
  - probing the winds in the middle atmosphere (e.g., Le Pichon et al., 2015; Amezcua et al., 2020) or
  - early warnings on volcanic eruptions (e.g., Marchetti et al., 2019).
- *But*: access to IMS infrasound waveform data is restricted (e.g., vDEC contract)
- Idea: tailored **open-access data products** of the broadband detection lists ("product of a product") – neither providing raw data nor the comprehensive detection lists, thus not replacing the privileges of a vDEC access or IDC-registered users (e.g., Reviewed Event Bulletin)

BGR Bundesanstalt für Geowissenschaften und Rohstoffe
GEOZENTRUM HANNOVER

Data availability





black: no processing result

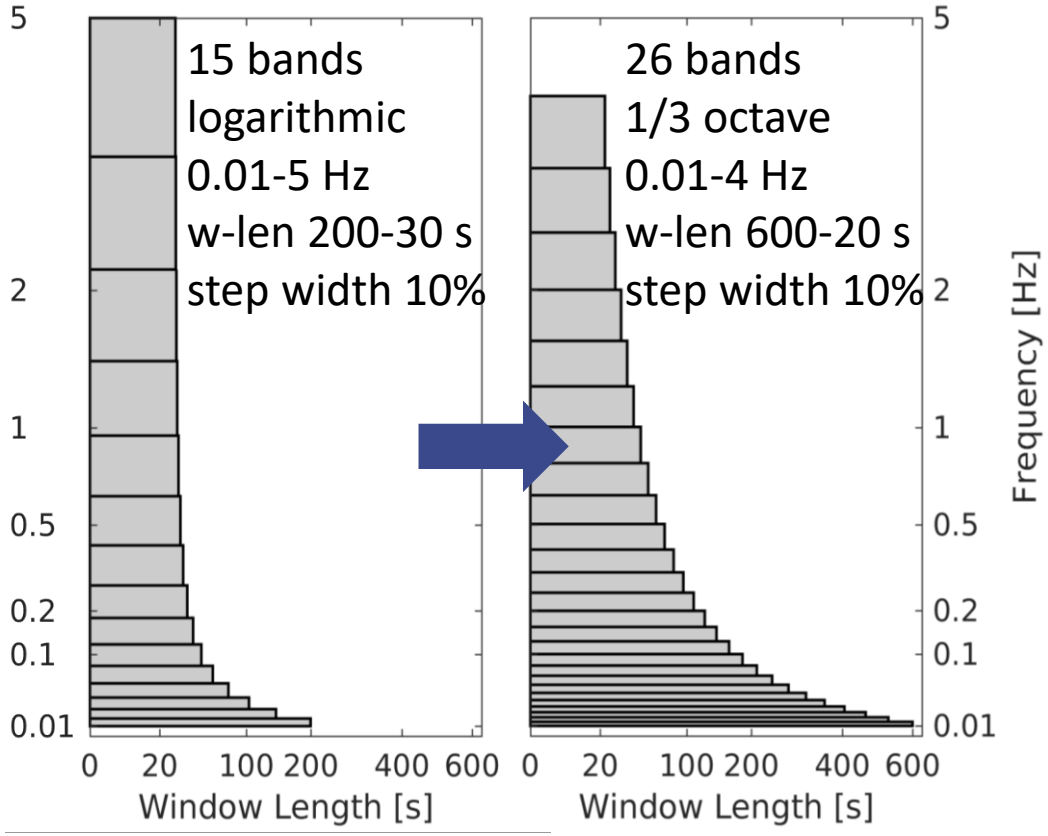
New PMCC version & configuration update

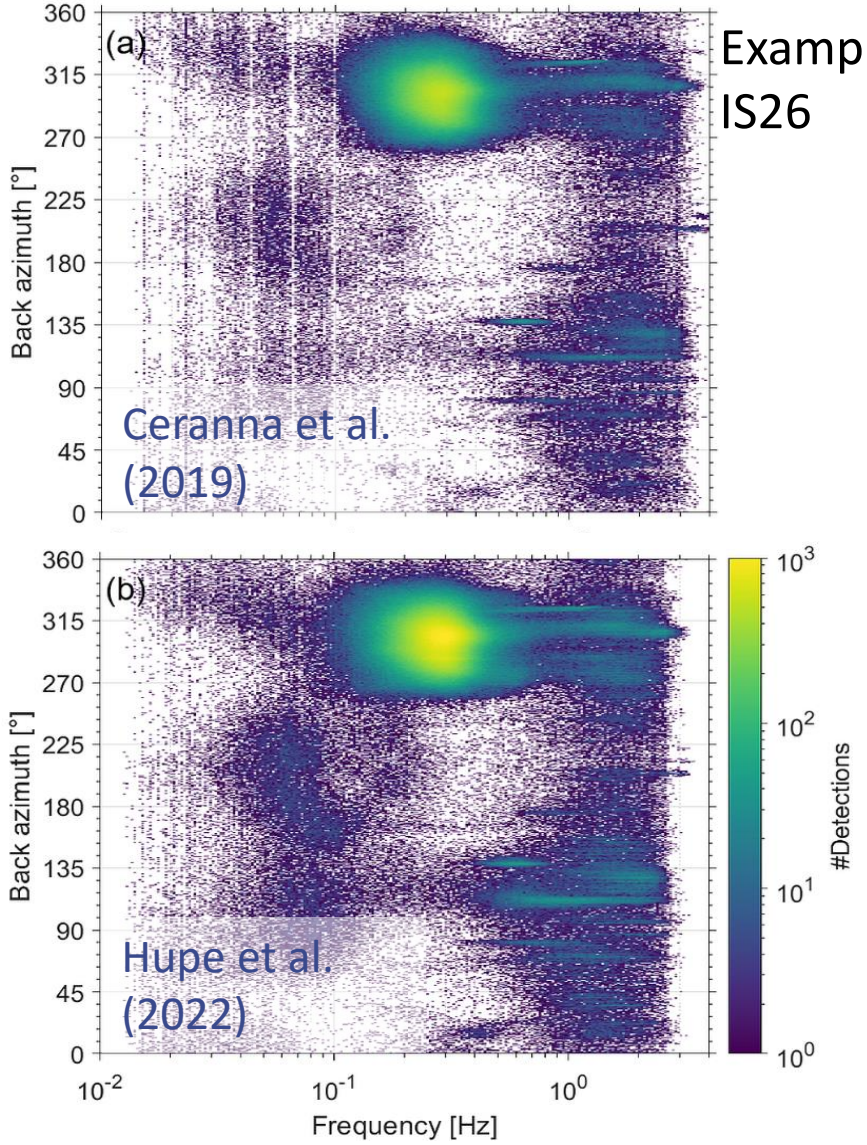
Matoza et al. (2013)
Ceranna et al. (2019)

15 bands
logarithmic
0.01-5 Hz
w-len 200-30 s
step width 10%

Hupe et al. (2022)

26 bands
1/3 octave
0.01-4 Hz
w-len 600-20 s
step width 10%





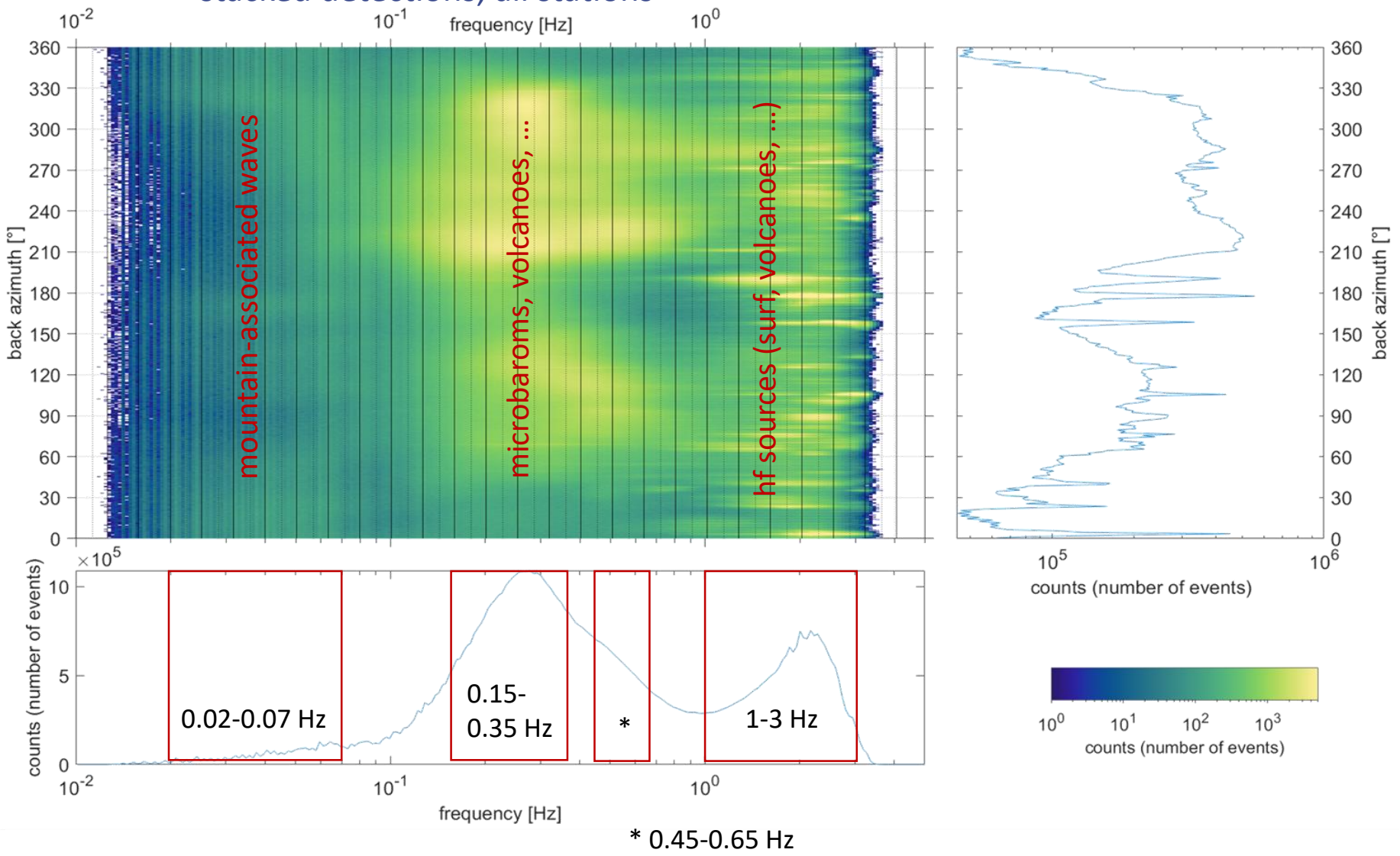
Example:
IS26

- more detections
- new sources resolved
- better discrimination between interfering signals
- more accurate estimate of signal parameters
- artefacts reduced

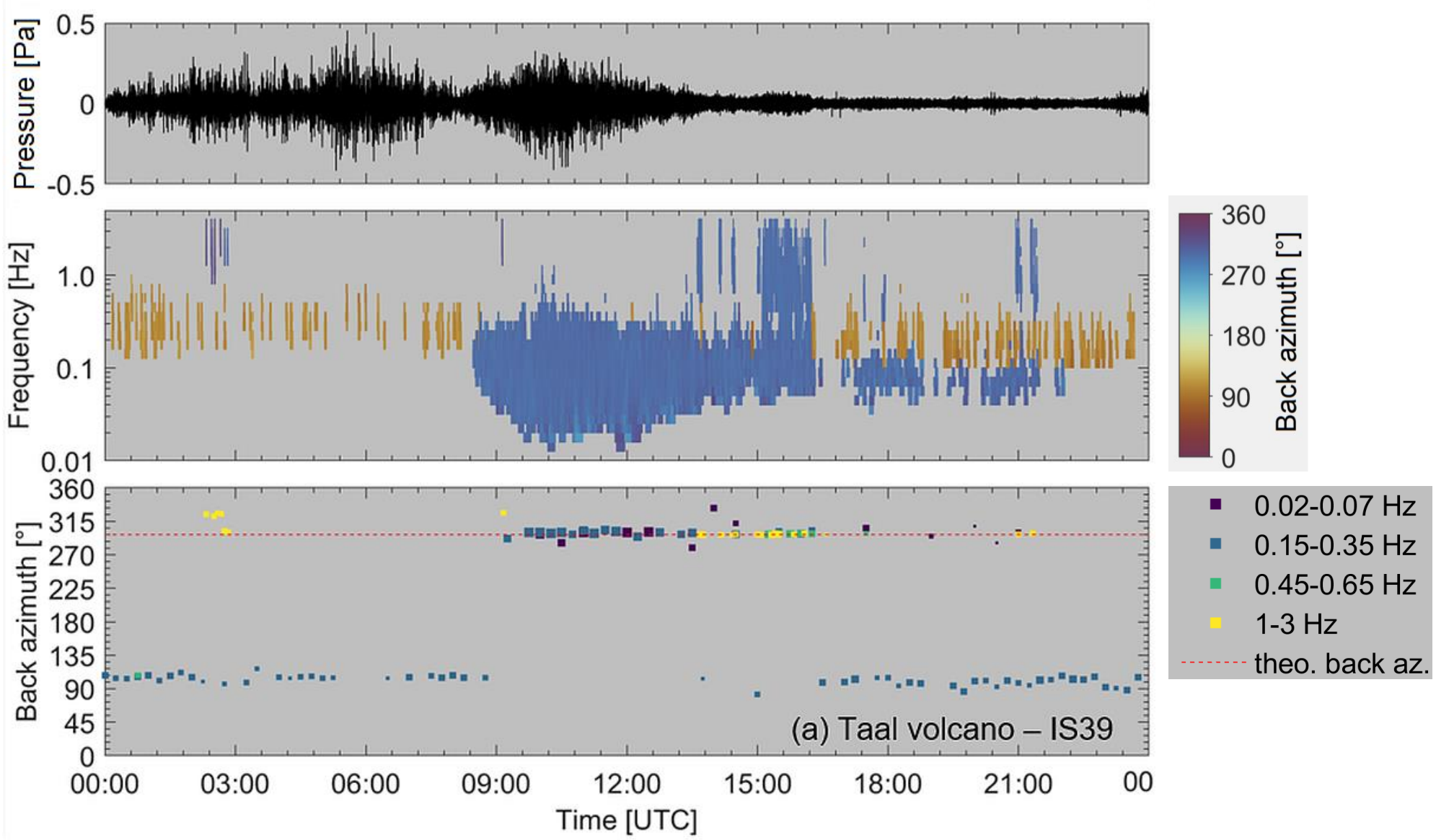
Four open-access infrasound data products

1) Low-frequency product (e.g. mountain-associated waves)
2) "Microbaroms" products, both
   2a) lower and
   2b) higher frequency spectrum
3) High-frequency product (e.g. volcanoes)

- Products summarize dominant detections within time window
- Temporal resolution 30, 15, and 5 min, resp.

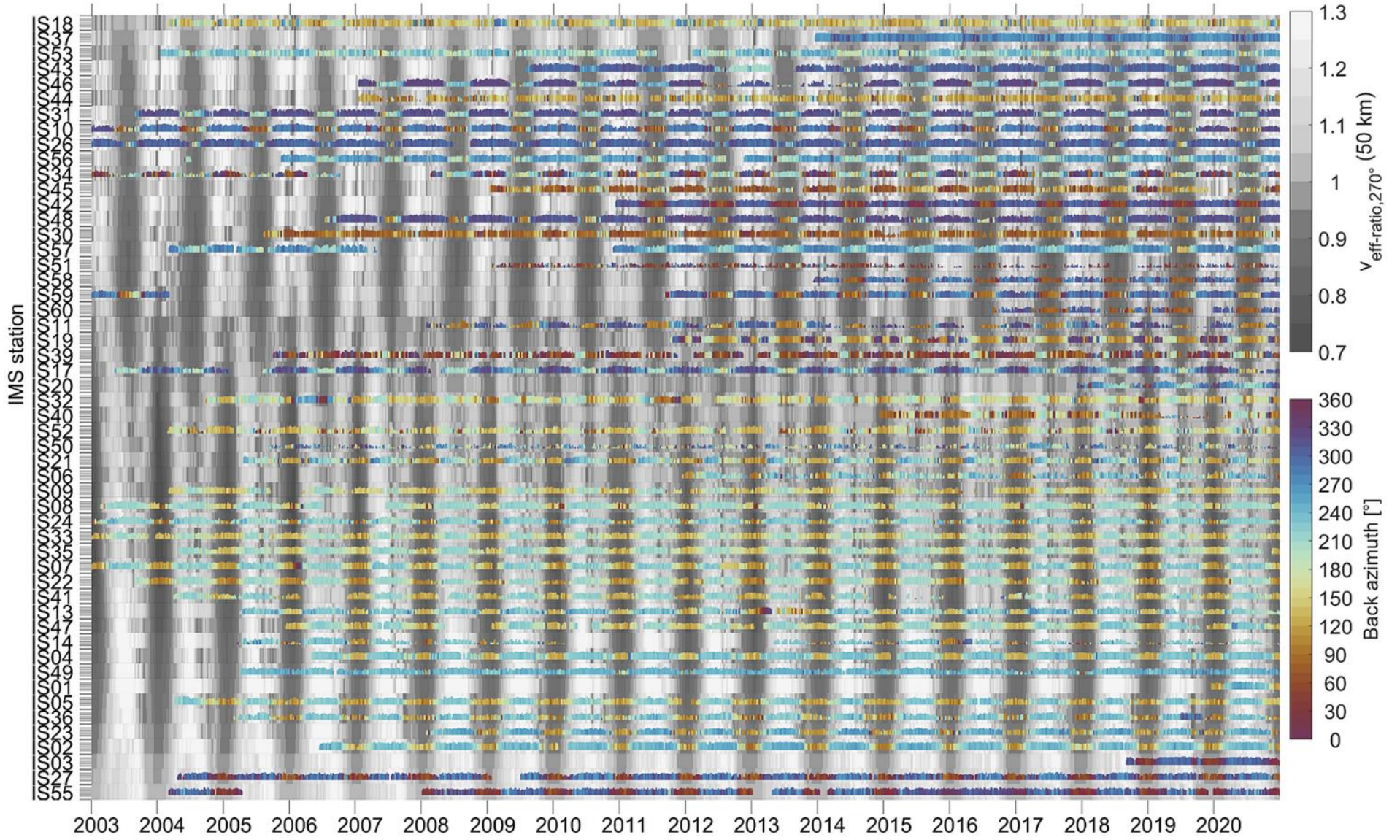


Example: Volcanic eruption (VEI 4) of Taal, Philippines, on 12 January 2020 @IS39, Palau



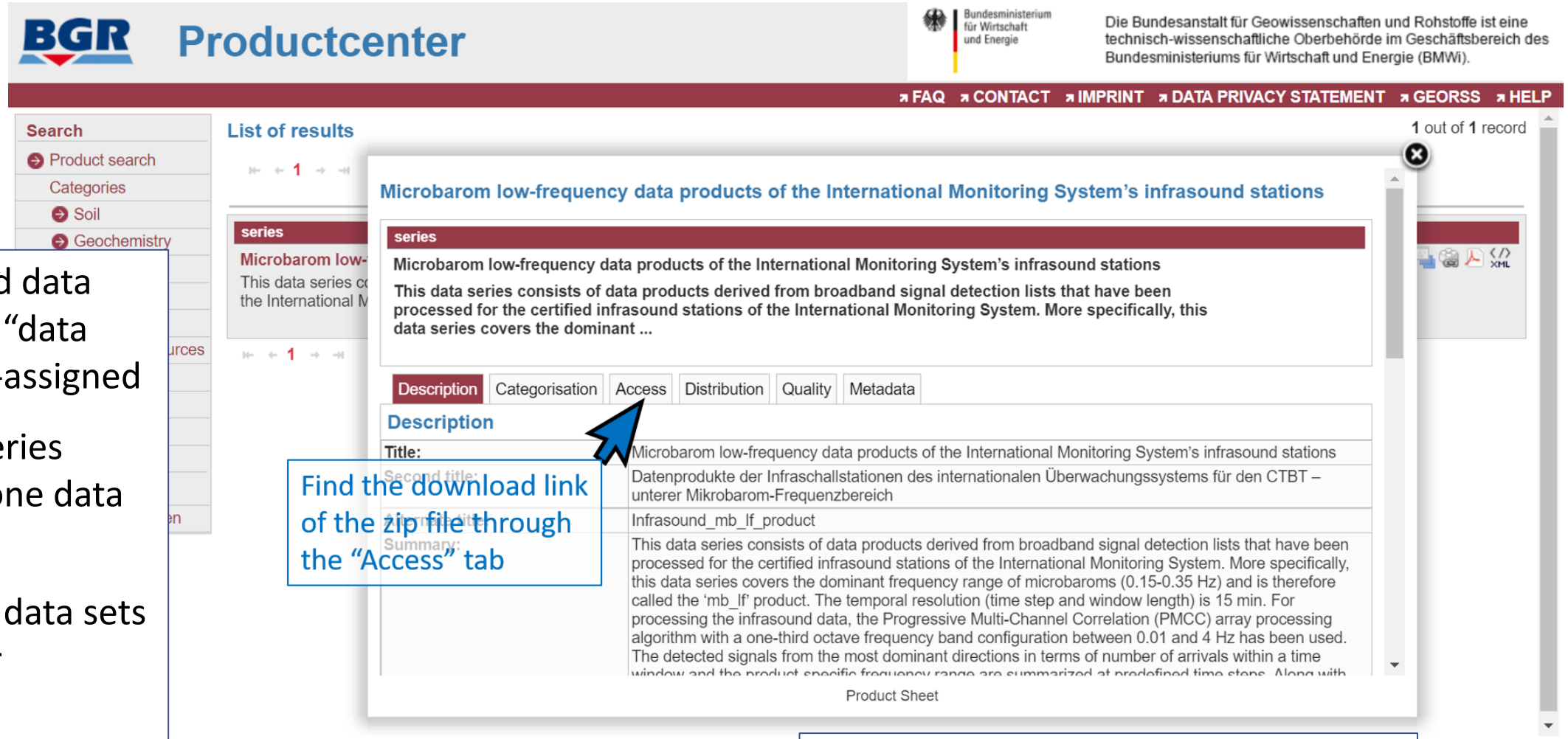
Example: Atmospheric dynamics reflected in microbaroms products

- Microbarom low-frequency product (0.15-0.35 Hz)
- Seasonal variation of the dominant (mean) back azimuth
- Time step: 4 days
- Time window: 8 days
- Propagation conditions from west to east



Open data products are accessible via BGR‘s „Produktcenter“

- Each defined data product is a “data series“, DOI-assigned
- Each data series consists of one data set per year
- So far: 18x4 data sets available for download



Data product DOIs can be found in the abstract of the ESSD discussion paper

Summary

- Make PMCC bulletin products available as a scientific dataset, **open access**
- **Specific products** from the detection lists, uniform processing scheme
- Quality parameters provided
- Reference database for natural infrasound sources
- Intended applications, e.g.: atmospheric studies, microbarom modelling, volcano monitoring, calibration
- First step: **full period 2003 to 2020 available, 2021 coming soon**
- Outlook: regularly updated products (“near-real-time”), but in accordance with vDEC transition period (3 months)

Patrick Hupe

Federal Institute for Geosciences and Natural Resources (BGR)
B4.3 Federal Seismological Survey, Nuclear-Test Ban

Patrick.Hupe@bgr.de

BGR Bundesanstalt für Geowissenschaften und Rohstoffe
GEOZENTRUM HANNOVER

Details & examples:

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References & Acknowledgements

References

Please find all references in

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Disclaimer

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