

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

Patrick Hupe¹, Lars Ceranna¹, Alexis Le Pichon², Robin S. Matoza³, Pierrick Mialle⁴

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

Preprint

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Abstract

Assets

Discussion

Metrics

15 Feb 2022

Status: this preprint is currently under review for the journal ESSD.

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

Patrick Hupe¹, Lars Ceranna¹, Alexis Le Pichon², Robin S. Matoza³, and Pierrick Mialle⁴

¹BGR, B4.3, D-30655 Hannover, Germany

²CEA, DAM, DIF, F-91297 Arpajon, France

³Department of Earth Science and Earth Research Institute, University of California, Santa Barbara, CA, USA

⁴CTBTO, IDC, Vienna, Austria

Discussion paper in
Earth System Science Data:

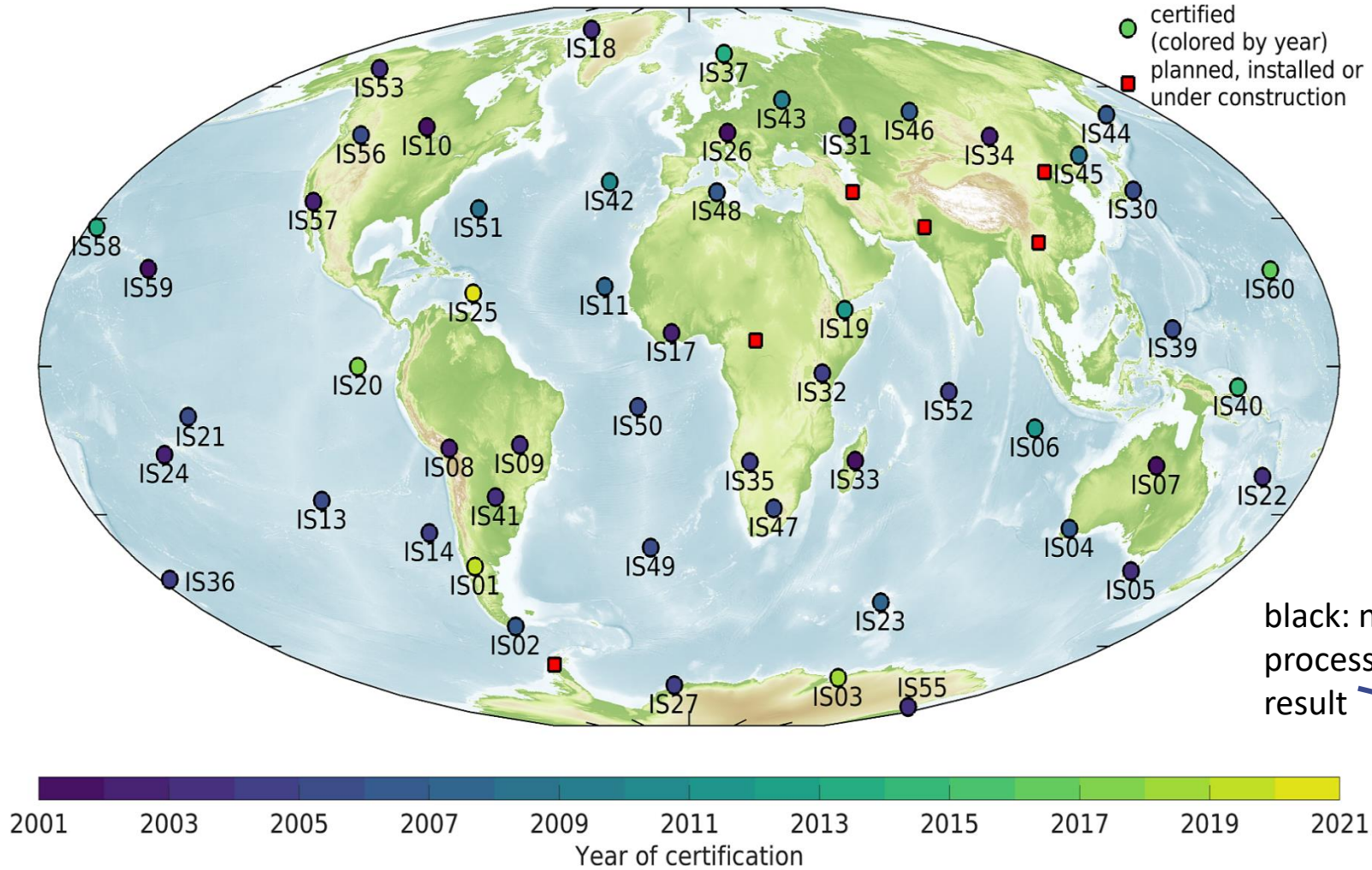


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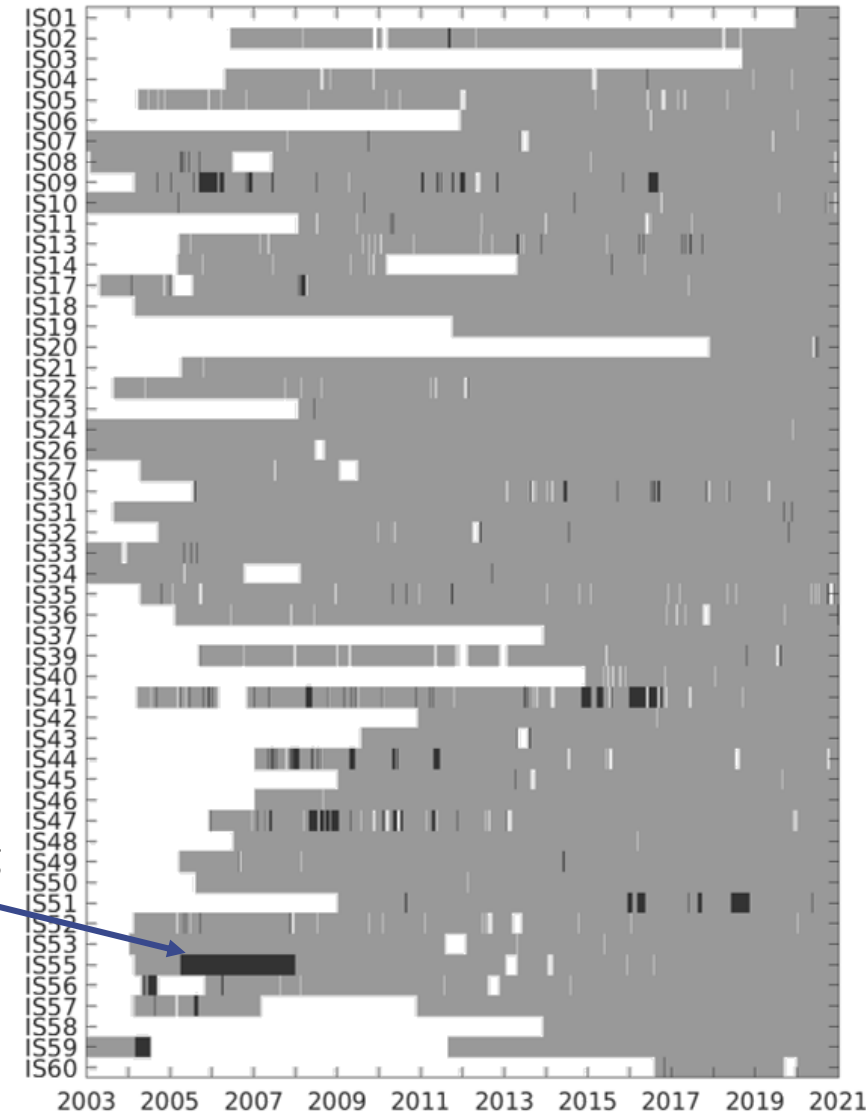
Tailored open-access data products of infrasound detection lists

- 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)

Data availability



black: no processing result

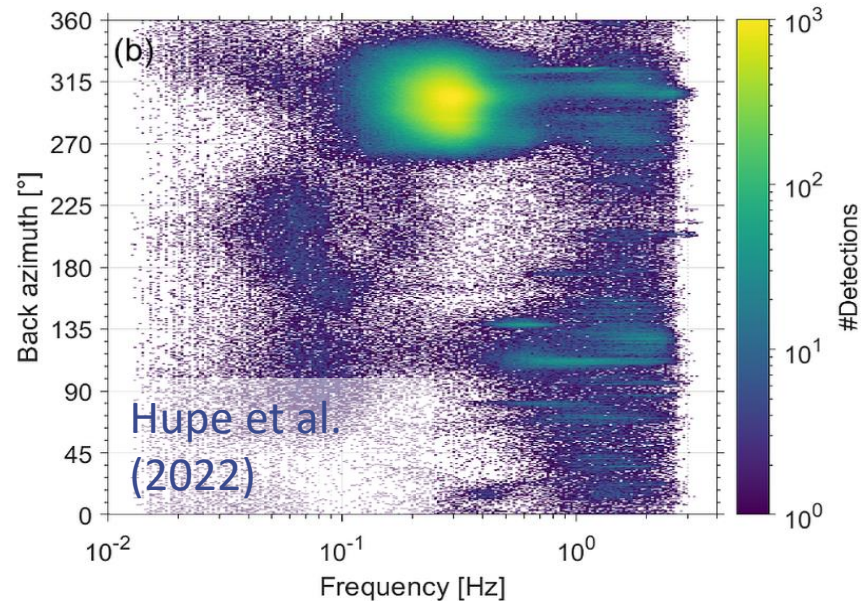
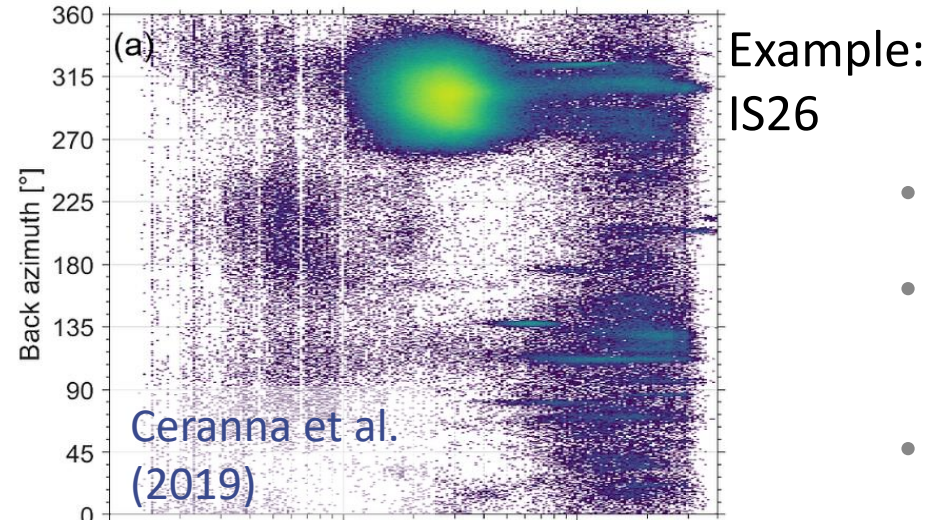
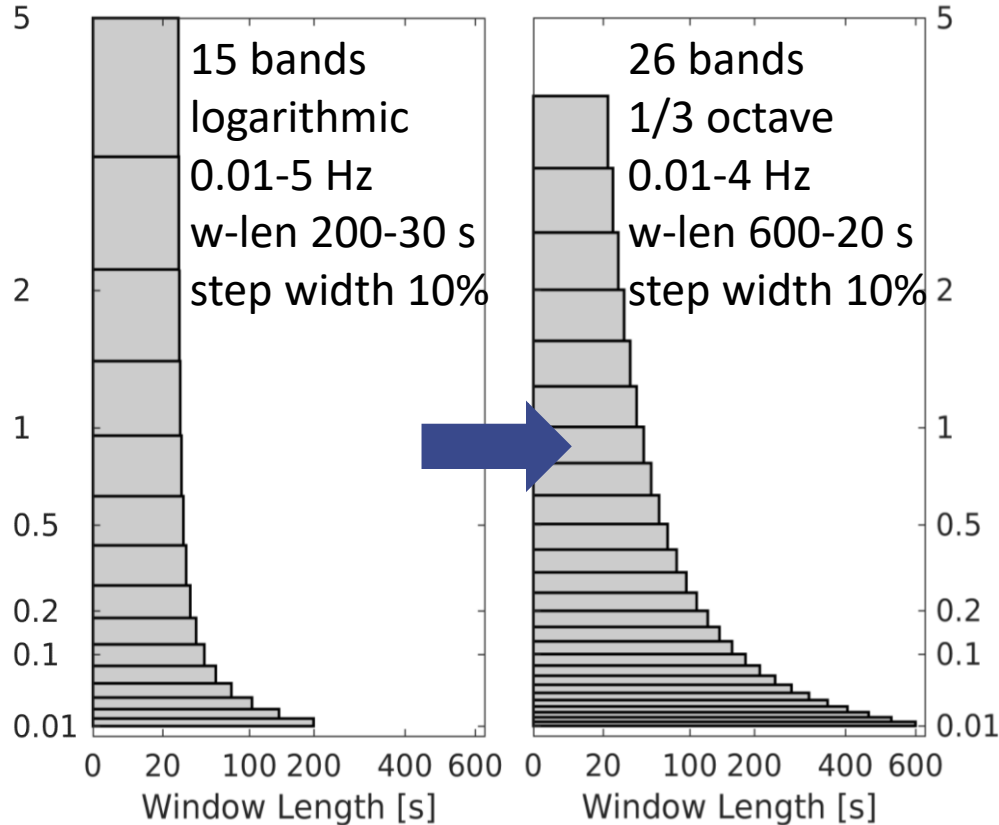


New PMCC version & configuration update

Matoza et al. (2013)

Ceranna et al. (2019)

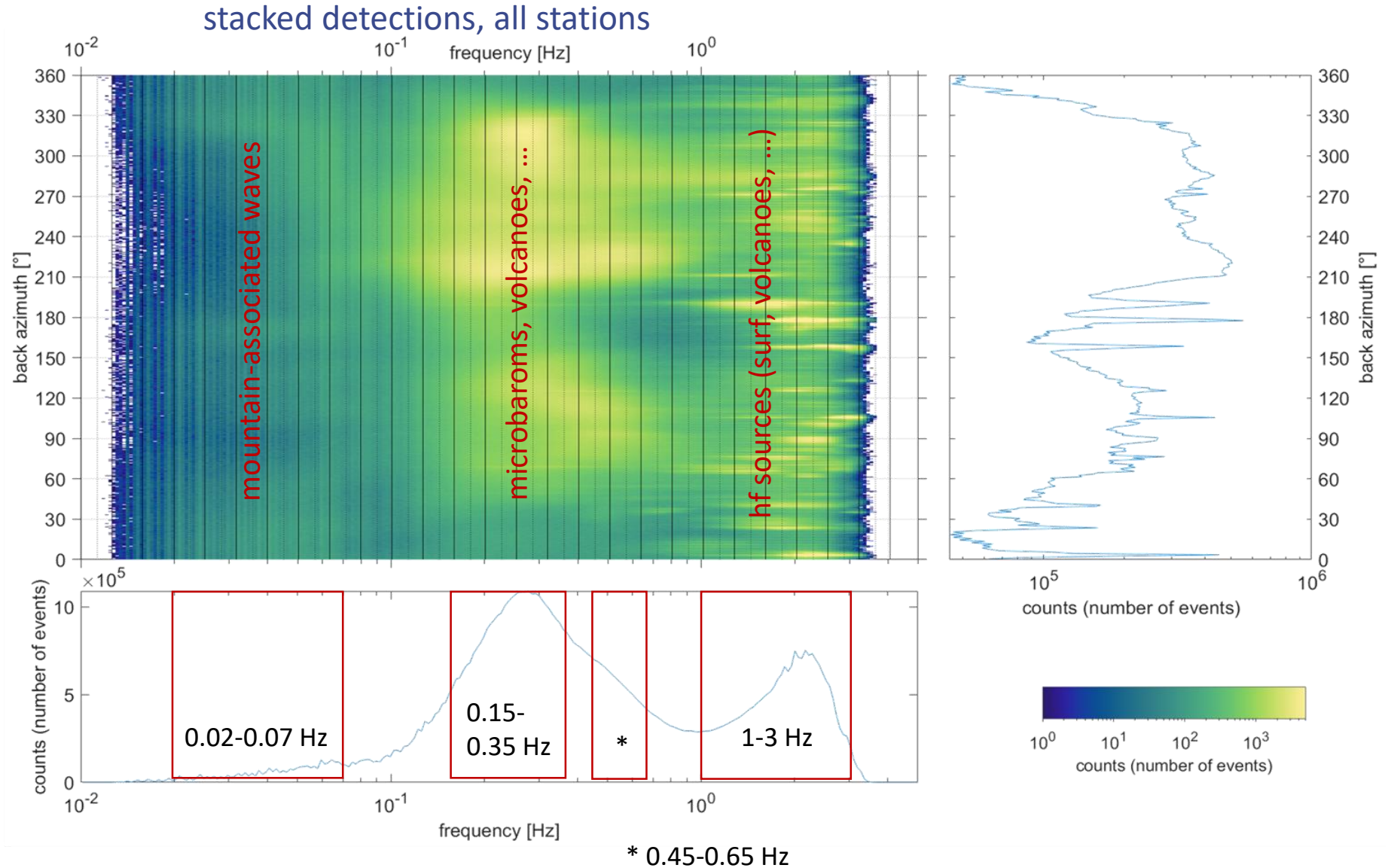
Hupe et al. (2022)



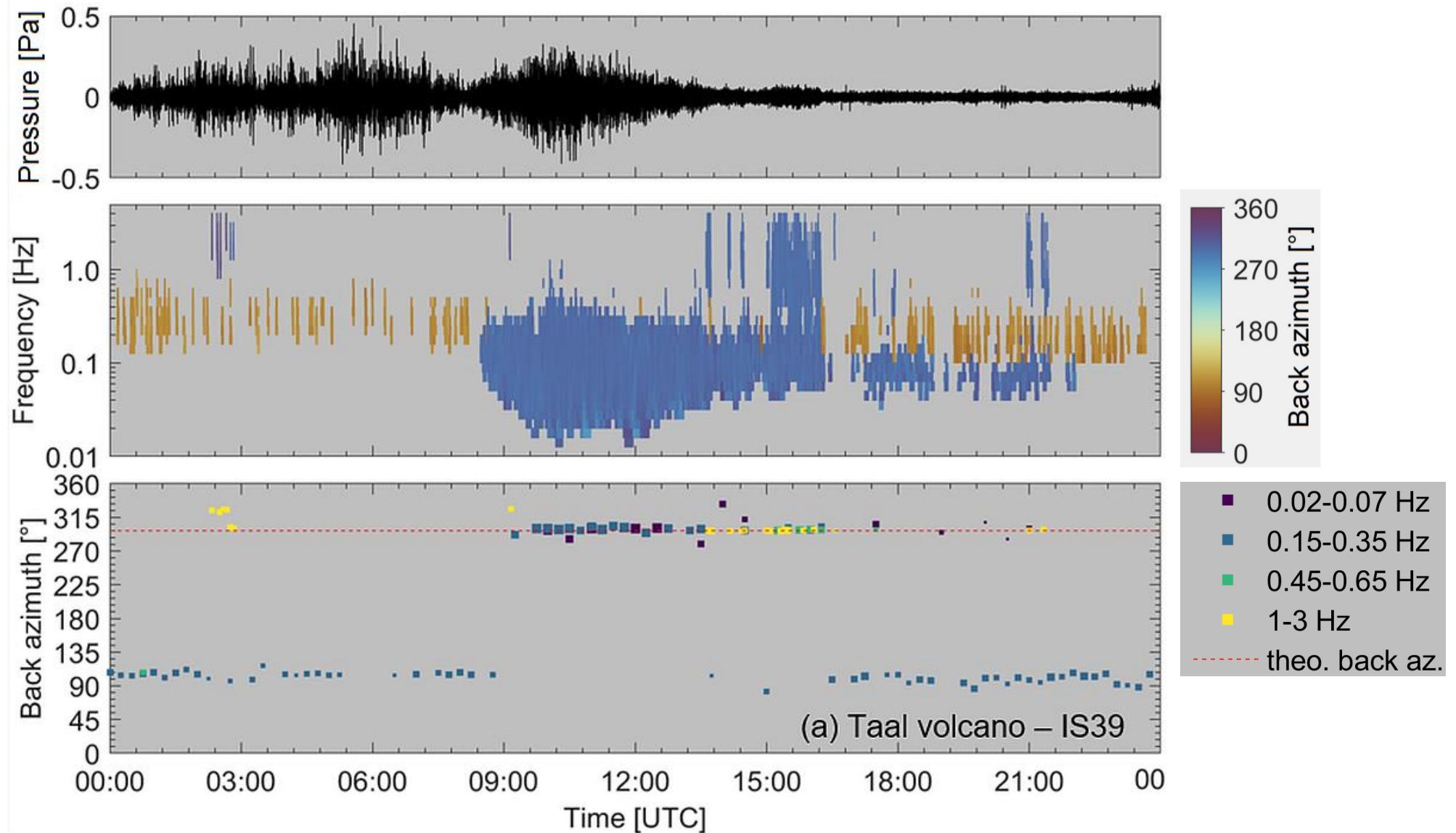
- more detections
- new sources resolved
- better discrimination between interfering signals
- more accurate estimate of signal parameters
- artefacts reduced

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.

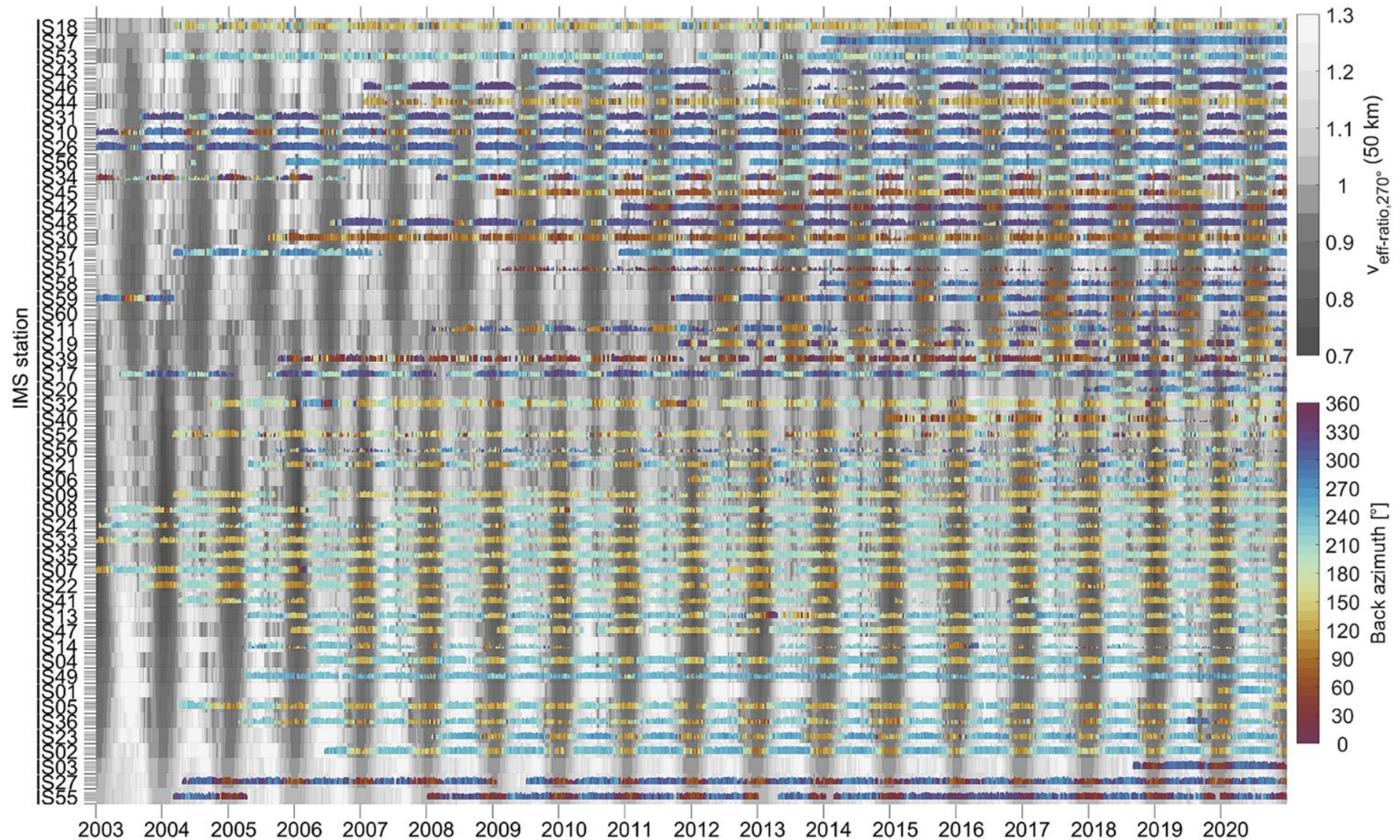


Example: Volcanic eruption (VEI 4) of Taal, Philippines, on 12 January 2020 @IS39, Palau



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“

BGR Productcenter

Bundesministerium für Wirtschaft und Energie

Die Bundesanstalt für Geowissenschaften und Rohstoffe ist eine technisch-wissenschaftliche Oberbehörde im Geschäftsbereich des Bundesministeriums für Wirtschaft und Energie (BMWi).

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1 out of 1 record

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List of results

1

series

Microbarom low-
This data series co
the International M

Microbarom low-frequency data products of the International Monitoring System's infrasound stations

This data series consists of data products derived from broadband signal detection lists that have been processed for the certified infrasound stations of the International Monitoring System. More specifically, this data series covers the dominant ...

Description | **Access** | Distribution | Quality | Metadata

Description

Title: Microbarom low-frequency data products of the International Monitoring System's infrasound stations

Second title: Datenprodukte der Infraschallstationen des internationalen Überwachungssystems für den CTBT – unterer Mikrobarom-Frequenzbereich

Summary: This data series consists of data products derived from broadband signal detection lists that have been processed for the certified infrasound stations of the International Monitoring System. More specifically, this data series covers the dominant frequency range of microbaroms (0.15-0.35 Hz) and is therefore called the 'mb_lf' product. The temporal resolution (time step and window length) is 15 min. For processing the infrasound data, the Progressive Multi-Channel Correlation (PMCC) array processing algorithm with a one-third octave frequency band configuration between 0.01 and 4 Hz has been used. The detected signals from the most dominant directions in terms of number of arrivals within a time window and the product specific frequency range are summarized at predefined time steps. Along with

Product Sheet

Find the download link of the zip file through the "Access" tab

- 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



Details & examples:



<https://doi.org/10.5194/essd-2021-441>

References & Acknowledgements

References

Please find all references in

Hupe, P., Ceranna, L., Le Pichon, A., Matoza, R. S., and Mialle, P.: International Monitoring System infrasound data products for atmospheric studies and civilian applications, Earth Syst. Sci. Data Discuss. [preprint], <https://doi.org/10.5194/essd-2021-441>, in review, 2022.

Disclaimer

The views expressed herein are those of the authors and do not necessarily reflect the views of the CTBTO Preparatory Commission.

Acknowledgements

All authors thank the CTBTO and the IMS station operators for guaranteeing the high quality of the infrasound data. PH acknowledges the CTBTO Preparatory Commission for providing limited access (via vDEC) to the IMS infrasound network data, which enabled us to undertake this study. RSM acknowledges support from NSF grant EAR-1847736.