## Pa04 - “The impact of extreme conditions on the CTBT monitoring” – Panel with keynote and discussion – Tuesday 9 September, 15:30-17:00

**Draft Overall timeline**

15.30 – Start of Event and introduction (PTS)

15.35 – Keynote talk Ms Rouil

16.00 – Introduction Panelists (Kathy to moderate and each one has 2 minutes with a dedicated slide)

16.10 – What is the impact of changing environmental conditions on the IMS data you use?

16.18 – Impact of environmental change on IMS stations/ Implications for NDCs

16.26 – Impact of environmental change on IMS data

16.34 – Trends in IMS data

16.42 – IMS data for civil and scientific applications

16:50 – Q&A

17:00 – End of event - Concluding statement (PTS)

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| **Time** | **What** | **Who** |
| 13.00 | In-person meeting onsite | All |
| ??.?? | Inspecting the setup and podium where the discussion will take place | Anne |
| **15.30** | **Start of panel session** |  |
| 15.30 | * Welcome * Outline session * Introduction Ms Rouil, give word to Ms Rouil | Anne T. |
| 15.35 | * Keynote talk * Including Q&A | Ms Rouil |
|  | * Introducing the main topics of the panel on a slide and invite the audience to comment and add questions in the SnT online tool * Panelists come on stage | Anne T. |
| **16.00** | **Introduction of panelists** |  |
|  | * Kathy to introduce herself * Each panelist gives a max 2 min introduction of themselves:   + Background   + How you use IMS data to monitor environmental conditions   + Use of template slide   Order of introduction: (suggestion by Anne)   1. Siobhan 2. Aidyn 3. Joanne 4. Robin 5. Bernardo | All |
| **16.18** | **Impact of environmental change on IMS stations/ Implications for NDCs** |  |
| Q1 | How can the IMS system be used to understand the impact of changing environmental conditions?   * (Joanne) A potential unique application of the IMS system is use of RN filters to monitor biodiversity. Explain - What is eDNA? Accumulation on IMS filters [DISPLAY Chapman Q1 slide 1] * (Joanne) Therefore, there is a potential to use filters to monitor environmental change - Daily snapshot of terrestrial biodiversity, global span and time-series to monitor impact of global change, extreme conditions, sudden events. But, no current work in this space because filters cannot currently be released back to host countries for scientific applications. [DISPLAY Chapman Q1 slide 2] | Joanne |
| Q2 | How do changing environmental conditions impact the equipment you use?   * (Robin) The main problems occur in the power supply and telemetry systems, which are affected by situations related to extreme rainfall and thunderstorms. Over time, different methods have been tested to maintain the continuity of the recorded seismic information, but these have always proven vulnerable to unfavorable environmental conditions. * (Joanne) Increased frequency and severity of extreme whether events. For example, Chatham Island IMS station, impact of extreme conditions and isolation, transport issues (storms etc), lack of local trained personnel. Sea level rise, melting of ice sheets (Antarctic station) etc. * (Siobhan) Hurricane impacts on seismic network in Puerto Rico: wind damage to equipment, communications outages affecting data transmission, impacts on staff * (Aidyn) Thunderstorms and lightning cause equipment failures. Snowstorms (Blizzards) damage equipment due to strong winds, lead to communication failures that interrupt data transmission, and pose additional risks to personnel. Extreme floods (2024, Kazakhstan) contributed to the destruction of roads, power lines, and other infrastructure, which also negatively affects the functioning of the stations. (DISPLAY EXTRA SLIDES) | Robin,  Joanne, Siobhan |
| Q3 | What adjustment is needed to maintain the CTBTO’s effectiveness?   * (Joanne) Challenges in certain areas subject to extreme corrosion, high winds, unpredictable swells, sea level rise etc may need enhanced planning, more durable engineering etc * (Robin) The use of redundant telemetry and power systems helps ensure high data availability, even though they may also be impacted by extreme environmental conditions. * (Joanne) Some IMS stations may need to be relocated. Cook islands and other stations close to the ocean may need to be moved further inland. The Antarctic station is a good example. In 1996, the location of the station was presumably perfectly safe. That particular station was designated to be built at a station on an ice shelf, turns out the ice shelf is moving and has had some major cracks, so they are now attempting to relocate the station but this is difficult within the bounds of the treaty. | Joanne, Robin |
| Q4 | What implications do extreme environmental conditions have on NDCs?   * (Aidyn) Wind, storms, and atmospheric turbulence increase background noise levels on seismic and infrasound stations, reducing the signal-to-noise ratio and complicating event detection. Lightning leads to false detections and the generation of false events, complicating accurate processing and analysis of seismic data. Abnormal heat creates increased load on air conditioning systems, which can lead to malfunctions and reduced equipment efficiency. |  |
| **16.26** | **Impact of environmental change on IMS data** |  |
| Q5 | What is the impact of changing environmental conditions on IMS data you use? |  |
|  | [cut this question or spontaneous answer?] |  |
| **16.34** | **Trends in IMS data** |  |
| Q6 | What trends in your data do you observe over time?   * (Siobhan) Arctic Ocean acoustics: changes in underwater sound speed due to changing temperature and salinity. This can locally change how the ocean carries sounds, making it more or less likely that distant sources will be detected. * (Siobhan) Noise varies seasonally due to sea ice cover and ocean wave activity. As sea ice decreases, especially in summer, we will expect to see summer conditions over longer portions of the year and increased impacts of wind and waves on the Arctic acoustic soundscape * (Siobhan) Human noise is increasing in areas where industrialization is taking place, including the Arctic. Increased noise can lead to fewer detections of small events. | Siobhan |
| Q7 | How does IMS data help to identify such trends?   * (Siobhan) Analyses of decades of IMS data has led to confirmation of long-term temperature rise in the oceans; these trends are smaller than seasonal and other temporal variability. * (Siobhan) Ocean wave energy is increasing on a decadal scale which has been confirmed using IMS and other stations | Siobhan |
| **16.42** | **IMS data for civil and scientific applications** |  |
| Q8 | How can we use the IMS data for the overall good?   * (Bernardo) The Global Tsunami Early Warning and Mitigation System (GTEWMS) is a mature and sustainable intergovernmental life-saving system. * (Bernardo) IMS seismic data (primary/auxiliary) has proven to be essential to the GTEWMS as early as in 2006 as presented in the report of Japan to WGB (99% data availability JMA experiment July 2006). * (Bernardo) We might be able to go one step further with the current testing phase of real time global assessment of tsunami risk using acoustic waves (check Session P1.4 on Thursday 11 September at 10:00). * (Joanne) Release of IMS filters for scientific purposes * (Robin) High detectability of local earthquakes in a region with insufficient instrumental coverage, enhancing the understanding of seismic hazard in the area. | Bernardo, Joanne, Robin |
| Q9 | What could be/are other areas where IMS data can contribute for the resilience to environmental changes/conditions.   * (Bernardo) National Tsunami Warning Centers (NTWCs) and (Regional) Tsunami Service Providers (TSPs) could access seismic, hydroacoustic and infrasound data under the current CTBTO-UNESCO Agreement. * (Bernardo) Ongoing and promising: connect CTBTO and UNESCO-IOC Capacity Building Activities. * (Siobhan) understanding ice and landslide processes and hazards and how these may be changing in areas exposed to risk | Bernardo (DISPLAY extra slide), Siobhan |
| **16.50** | **Q&A Session with the Audience** |  |
|  | * Anne will select suitable contributions from the audience that were send via the SnT app and send them to Kathy’s tablet. * Kathy can choose to take questions from the audience where people are standing in front of microphones (need to confirm that this will be the setup) |  |
| **17.00** | **End of Session** | **PTS closing** |