

Analysing High Frequency Radar Outages in the Ibiza Channel via HOORT: A Case Study

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Abstract – Improving coordination and management of coastal observatories is essential to create effective observing networks. To this aim, the High-Frequency Radar (HFR) Online Outage Reporting Tool (HOORT) has been created to support HFR stations' operations and maintenance, and to provide useful performance metrics. This work presents the first results derived from the long-term monitorization (2012-2023) of the Ibiza Channel HFR network using HOORT. Results revealed that most outages are related to power failures, software-related issues and communication problems. This type of information can be used to effectively manage HFR networks, by focusing maintenance efforts on recurring issues. In addition, the information and metrics provided by HOORT allow to continuously assess and promote the readiness level of the European HFR network.

Keywords – High frequency radar, ocean observing, management, performance, outage

I. INTRODUCTION

The HFR Online Outage Reporting Tool (HOORT) is a web-based application (<https://hoort.hfrnode.eu/>) developed in the framework of the EuroSea [1] and JERICO-S3 [2] projects with the aim of supporting operations and maintenance of European HFR stations. HOORT allows HFR operators to report and categorise problems to later extract useful performance metrics. Through the tool's Dashboard, operators can easily get a glimpse of historical failures and Key Platform Performance Indicators (KPPIs). The latter allow to assess reliability, which is the second criteria considered in JERICO-S3 [3] to evaluate station performance. This information allows to not only manage HFR networks effectively, but also to continuously assess and promote the readiness level of the European HFR network. With the information gathered by HOORT, operators can know which are the most common causes of outages at their stations, which of them increase downtime the most, or how outages evolve in time. This work provides answers to the aforementioned questions using results derived from more than a decade (2012-2023) monitoring the Ibiza Channel HFR network.

II. DATA & METHODS

Records of 190 outages affecting the Ibiza Channel HFR network were retrieved from HOORT's database. An outage record is automatically created whenever the last radial file received at the European HFR Node Database is older than 12 hours (see [1] for a description of the data flow). Then, the operator is automatically notified by email and asked to provide details about the outage. The information gathered is then used to produce KPPIs and charts that provide different metrics.

III. RESULTS

The outages recovered from HOORT's database revealed power and computer/software-related failures as the most common, followed by communication issues (Fig. 1a). The evolution of outages in time (Fig. 1a) shows an increase of failures in 2016, which is nonetheless related to a more thorough monitorization of the network from that year onwards. 2017 was marked by the accidental demolition of an HFR station's cabin during renovation works in the property where it was installed, and resulted in 4 months downtime. Throughout the following year, recurrent interventions related to rebuilding works resulted in a high number of power-related outages and extended downtime periods. Additionally, there was a hardware failure, the documentation of which later allowed us to identify a piece of hardware causing recurrent

problems. Power outages increased again in 2023 following the upgrade of the electrical grid performed by the land owners, who inadvertently disconnected the radar's electric meter.

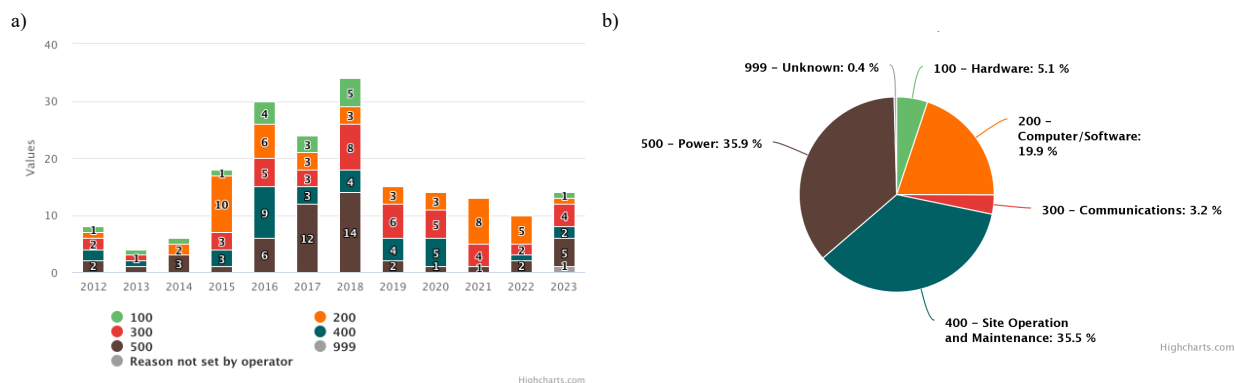


Fig. 1. Examples of some of the charts available in HOORT's Dashboard (<https://hoort.hfrnode.eu/>), where information about KPIs, and data annotations are also available. a) Number of outages of the Ibiza HFR network, by year and type of failure, b) Percentage of downtime per type of failure. The outage codes shown were defined following those of the U.S MARACOOS/IOOS HFR network, and are described in [4].

In addition to the number of outages, it is also useful to establish which of them increase downtime the most. This information can be extracted from the chart depicted in Fig. 1b, which shows power-related failures as those resulting in highest data loss. The second outage type in terms of data loss is site operation and maintenance, but this is mainly related to the aforementioned rebuilding of the radar cabin being labelled as such. The chart also shows that although the second in number of outages, communication-related issues result in a lower data loss, since the information is generally recovered after the outage's resolution. The KPIs show the Ibiza HFR network has been operational 96% of the time since 2012, with 18% of the time dedicated to maintenance activities, and the 100% of outages reported and solved by the operator.

IV. CONCLUSIONS

Results showed that power failures are responsible for most of the Ibiza Channel HFR network's outages and data loss. Some of the longest downtimes were related to accidental interventions from people working in the area, and suggest that close collaboration with other land users, as well as clear warning labels are necessary to improve station uptime. Although communication issues were responsible for a high number of outages, these caused low data loss. Finally, the calculated KPIs evidenced the reliability and cost-effectiveness of the network.

The results described here provide useful information that can help tailoring operations, focusing maintenance efforts and hardware investments to mitigate downtime, and identifying common outage causes to keep improving the technology. The present analysis could be expanded in the future using information collected by HOORT for all the European HFR network, and can be easily adapted to monitor other observing networks such as gliders, fixed stations or ferry boxes.

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