Poster: Beyond IP: Amateur Radio PSKReporter as a Crisis Measurement Tool

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Abstract

Traditional Internet measurements rely heavily on IP-based vantage points to assess large-scale disruptions, overlooking less conventional but informative data sources. This leaves critical gaps in our understanding of how crises affect specific regions and alternative communication systems. Using PSKReporter's amateur radio data, we present two case studies where distinct signals of crisis events were captured, even when IP-based measurements alone may fall short. During the LA wildfires, PSKReporter spots dropped by 36%, with no comparable decline in IP-based data. For Hurricanes Milton and Helene, spot declines appeared several days earlier than IP-based indicators. These insights open new avenues for studying the resilience of diverse infrastructures during emergencies.

CCS Concepts

• **Networks** → **Network measurement**.

Keywords

PSKReporter, Natural-Disaster Impact, Hurricane, Wildfire

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1 Introduction

The Internet measurement community has long relied on established instruments—mainly active measurements in the IP space [2, 5, 7, 8] and, in some cases, passive traffic analysis [3]—to understand how crises, outages, and other disruptions affect connectivity. While these approaches have yielded key insights, they can miss telling details about specific user groups, specialized protocols, or alternative communication systems that likewise experience shifts during critical events. In this work, we present a complementary perspective: analyzing the PSKReporter network, an Internet-based signal reporting system for amateur radio traffic.

Our study explores how PSKReporter data can illuminate the impacts of crisis events. Specifically, we show that the impact of Hurricanes Milton and Helene as well as the LA wildfires is perceptible in PSKReporter's reports. This observation underscores the network's potential to augment existing IP-based measurements of crisis response and broaden the lens of Internet measurement altogether. By diving into a relatively under-examined ecosystem-amateur radio transmissions gathered and shared in near-real time—we raise new questions about how and where Internet researchers can discover pertinent data. We reflect on this environment's importance, describe the unique challenges embedded in gathering and interpreting signal reports, and suggest how this type of information might lead to further technological and policy insights. Through this poster, we aim to spark discussion on inventive ways to measure online and offline phenomena during crises, showing that lesser-known services like PSKReporter can play a pivotal role in evolving Internet measurement practices.

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2 Data Set

We obtain a full, unsampled feed of amateur-radio digital-mode reception reports from the PSKReporter service (`pskreporter.info`). PSKReporter is a worldwide, crowd-sourced platform that logs every digital-mode transmission that is received and reported by participating stations. By focusing on stations in Florida and LA that continued uploading reports during crises, we capture a unique vantage point on real-world connectivity: since reception reports require both power and Internet access, their presence indicates that stations remained operational under crisis conditions. This approach enables us to assess network resilience beyond conventional Internet-based measurements.

Ethics. Amateur radio transmissions are unencrypted by law, making them freely receivable by anyone with proper equipment. The data we use, sourced from pskreporter.info, is publicly available. Our analysis relies solely on aggregated, self-reported station locations; we do not profile individual users. By using openly accessible information and refraining from any personal tracking, we respect both operator privacy and the principles of responsible data use.

3 Case Study 1: Hurricane Helene & Milton

In late September 2024, Hurricane Helene struck Florida's Big Bend as a Category 4 storm with 140 mph winds and widespread flooding, leaving 4.7 million without power—many for over a week. Two weeks later, Hurricane Milton made landfall as a Category 3 storm with 120 mph winds, prompting evacuations of 6 million, spawning tornadoes, and cutting power to 3.3–3.4 million. These outages are expected to affect Internet traffic in the impacted regions.

Figure 1 shows the number of PSKReporter spots transmitted from and received by stations located in Florida before, during, and after the hurricanes. For this, we are using the self-reported sender and receiver locations in PSKReporter. *Received* refers to reports

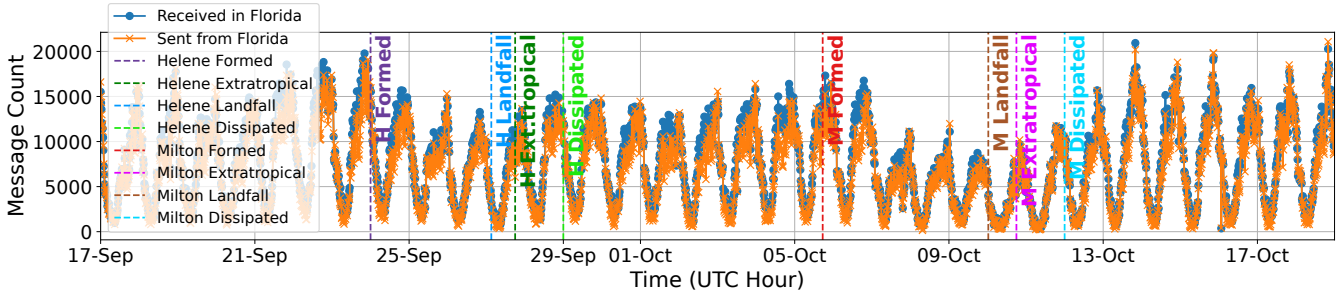

Figure 1: Amateur Radio activity in Florida before, during and after Hurricane Milton and Helene.

sent from stations in Florida to PSKReporter over the Internet, requiring Internet connectivity. *Sent* refers to transmissions from these stations that were picked up by other stations worldwide, requiring power but not necessarily Internet access.

Interestingly, spot counts drop by about 32% two days *before* Hurricane Helene and 49% three days before Hurricane Milton made landfall. Overall, spot counts decline by roughly 63% from pre-storm levels, indicating significant disruption. This trend is further corroborated by Belson [1], which reported a > 50% drop in Florida Internet traffic after Milton's landfall compared to the previous week's peak. Interestingly, IP-based measurements [4, 6] showed very little impact in Florida for Hurricane Helene, whereas the PSKReporter showed a significant drop in spot counts. Additionally, the results show larger impacts in Florida from Hurricane Milton (Category 3) than from Hurricane Helene (Category 4), this was also further corroborated by IODA's blog [6] and dashboard [4].

Notably, even though power outages were reported before landfall, both [1, 4] show that traffic and reachable networks drop sharply only after landfall, whereas PSKReporter spot counts begin declining several days earlier. The early decline in radio activity is likely due to operators evacuating, but disentangling causes, whether evacuations, power loss, or physical damage, is difficult from the data alone. Additionally, we observe a larger decline (≈54%) in South Carolina spot counts during Hurricane Helene, compared to a smaller decline (≈23%) in North Carolina, despite reports of greater damage there. This partially aligns with IODA's findings [6] but the disruptions for North Carolina were much less severe in the PSKReporter data. These results highlight that PSKReporter data offers a complementary view of network disruptions, capturing patterns that IP-based measurements may miss.

4 Case Study 2: LA Wildfires in 2025

In January 2025, large wildfires burned across Los Angeles County, lasting from early to late January. The fires forced widespread evacuations and damaged infrastructure, highlighting how such disasters can affect such regions. During the crisis, public agencies relied heavily on the Internet and social media to share evacuation orders, fire maps, and updates with residents in real time. To the best of our knowledge, there were no large-scale Internet outages or traffic drops reported in the area; however, tens of thousands of homes lost power. Figure 2 shows the number of PSKReporter spots transmitted from and received by stations in Los Angeles County. Spot counts dropped by roughly 36%, indicating that a significant

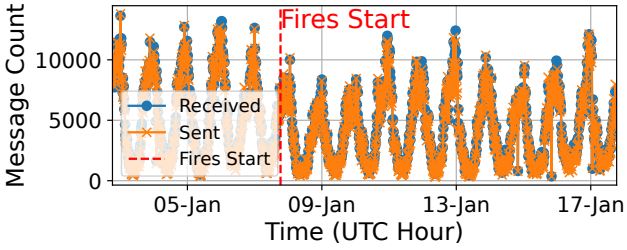

Figure 2: Amateur Radio activity in Los Angeles – 5 days before and 10 days during the LA wildfires.

number of operators were affected by the wildfires. This case study further demonstrates how PSKReporter data provides a different perspective on network usage during crises, which would have been totally missed via pre-existing IP-based measurements.

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References

[1] David Belson. 2025. *A diversity of downtime: the Q4 2024 Internet disruption summary.* https://blog.cloudflare.com/q4-2024-internet-disruption-summary/
[2] Zachary S. Bischof, Kennedy Pitcher, Esteban Carisimo, Amanda Meng, Rafael Bezerra Nunes, Ramakrishna Padmanabhan, Margaret E. Roberts, Alex C. Snoeren, and Alberto Dainotti. 2023. Destination Unreachable: Characterizing Internet Outages and Shutdowns. In *ACM SIGCOMM.*
[3] Anja Feldmann, Oliver Gasser, Franziska Lichtblau, Enric Pujol, Ingmar Poese, Christoph Dietzel, Daniel Wagner, Matthias Wichtlhuber, Juan Tapiador, Narseo Vallina-Rodriguez, Oliver Hohlfeld, and Georgios Smaragdakis. 2020. The Lockdown Effect: Implications of the COVID-19 Pandemic on Internet Traffic. In *ACM Internet Measurement Conference.*
[4] IODA. [n. d.]. . https://ioda.inetintel.cc.gatech.edu/region/4437?from=1726612287&until=1729171887
[5] Akshath Jain, Deepayan Patra, Peijing Xu, Justine Sherry, and Phillipa Gill. 2022. The ukrainian internet under attack: an NDT perspective. In *ACM Internet Measurement Conference.*
[6] Tara Kelly, Amanda Meng, Zachary Bischof, and Alberto Dainotti. [n. d.]. *Hurricane Helene Leaves Southeast Cut Off From Internet Amid Widespread Outages.* https://ioda.inetintel.cc.gatech.edu/reports/hurricane-helene-internet-connectivity/
[7] Ramakrishna Padmanabhan, Aaron Schulman, Dave Levin, and Neil Spring. 2019. Residential links under the weather. In *ACM SIGCOMM.*
[8] Aaron Schulman and Neil Spring. 2011. Pingin' in the rain. In *ACM Internet Measurement Conference.*