Current TCCON status and needs to support next-generation missions

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Review of TCCON structure

- Each site is operated by a local PI at a university, government lab, or similar
- 3 regional co-chairs with deputies (Americas, Europe/Africa, Asia/Oceania), algorithm co-chair & deputy, plus overall network chair
- Co-chairs assist individual sites when needed and coordinate multi-site concerns (e.g., paper coauthorship)
- Central TCCON infrastructure (a priori profile generation, data hosting) established at Caltech

Region/role	Co-chair	Deputy
Americas	Debra Wunch (U. Toronto)	Coleen Roehl (Caltech)
Europe/Africa	Thorsten Warneke (U. Bremen)	Dietrich Feist (DLR)
Asia/Oceania	Nicholas Deutscher (U. Wollongong)	David Pollard (NIWA)
Algorithm	Josh Laughner (JPL)	Geoffrey Toon (JPL)

Active sites	29
Past/campaign	6
Establishing	3

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Use of TCCON data to validate satellite observations

We have found TCCON used or intended for use as a source of validation for all these missions, either in their validation plans, the scientific literature, or private communication
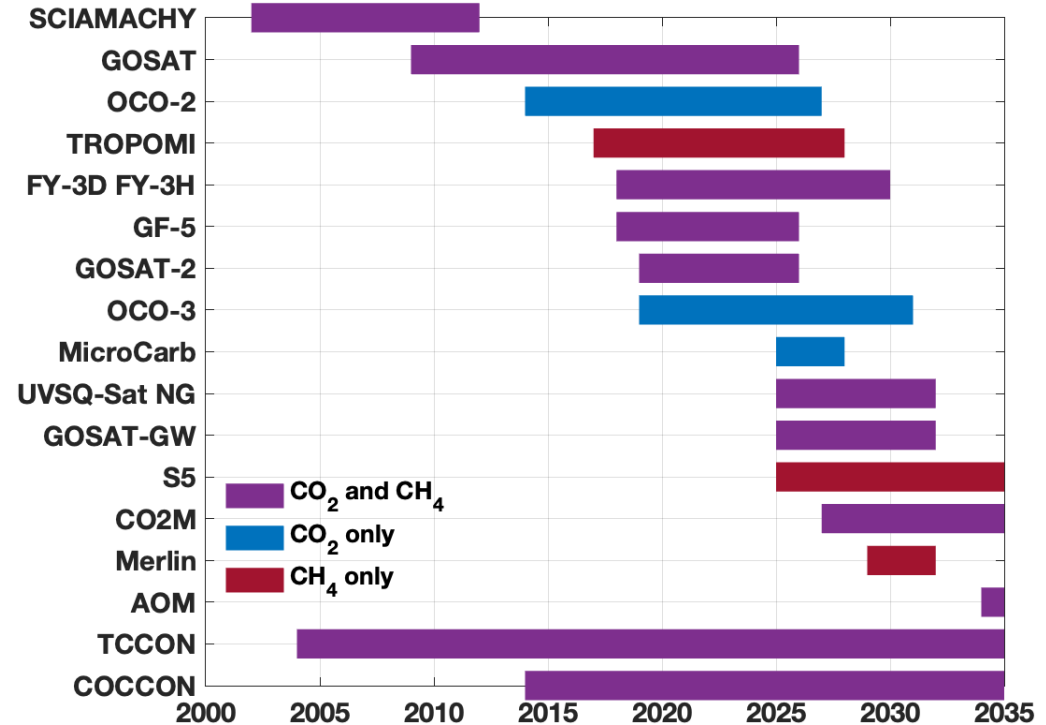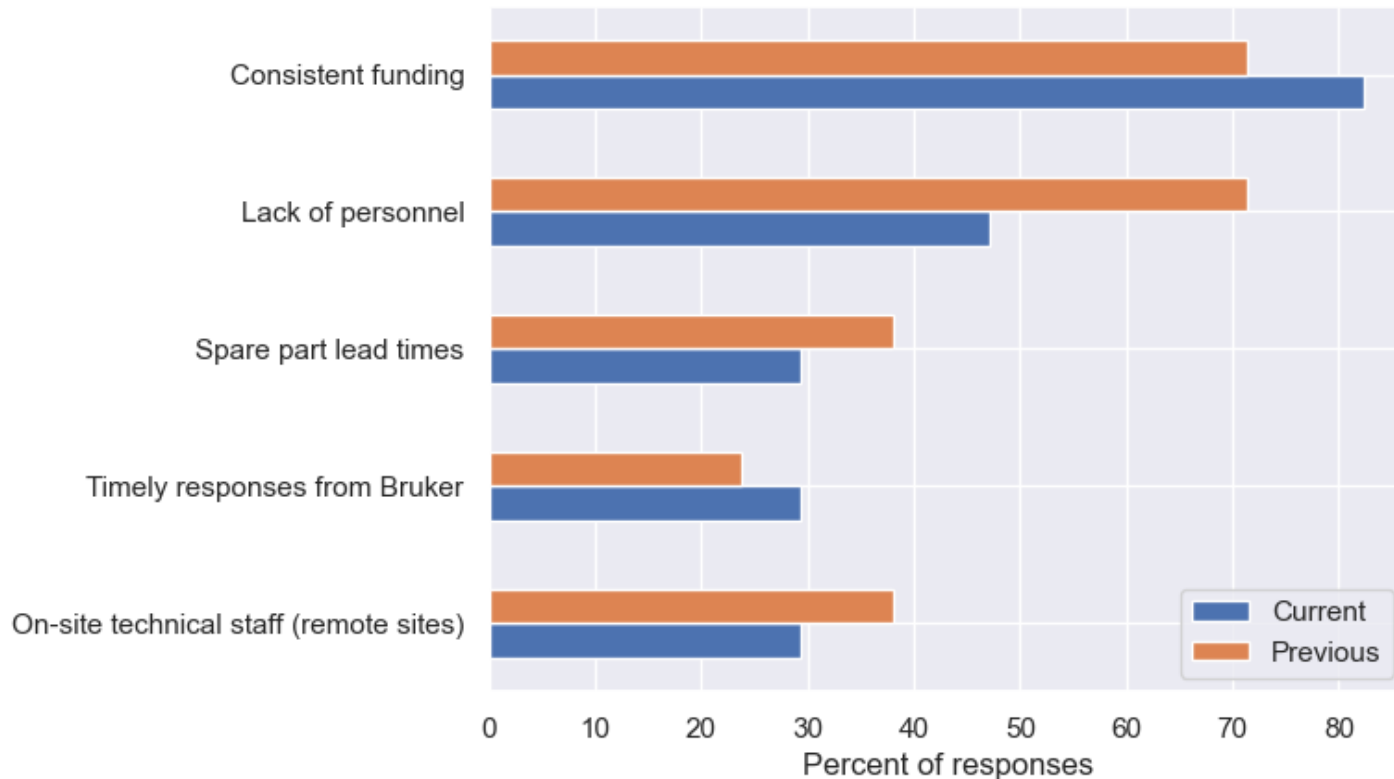
TCCON funding

- Each site requires funds for personnel to operate/maintain the instrument and process the data

- Each site also requires funds to purchase replacement parts as needed, with costs ranging from order ~$1k to ~$100k depending on the part

- Centralized algorithm development and core network infrastructure at JPL/Caltech has thus far been supported by NASA, both directly and through OCO-2/3

- **Site PIs typically assemble a funding portfolio through combinations of competed grants, mission funds, and other national funding. Despite the value of TCCON being as a coherent network, it has not been possible to fund the network as a whole.**
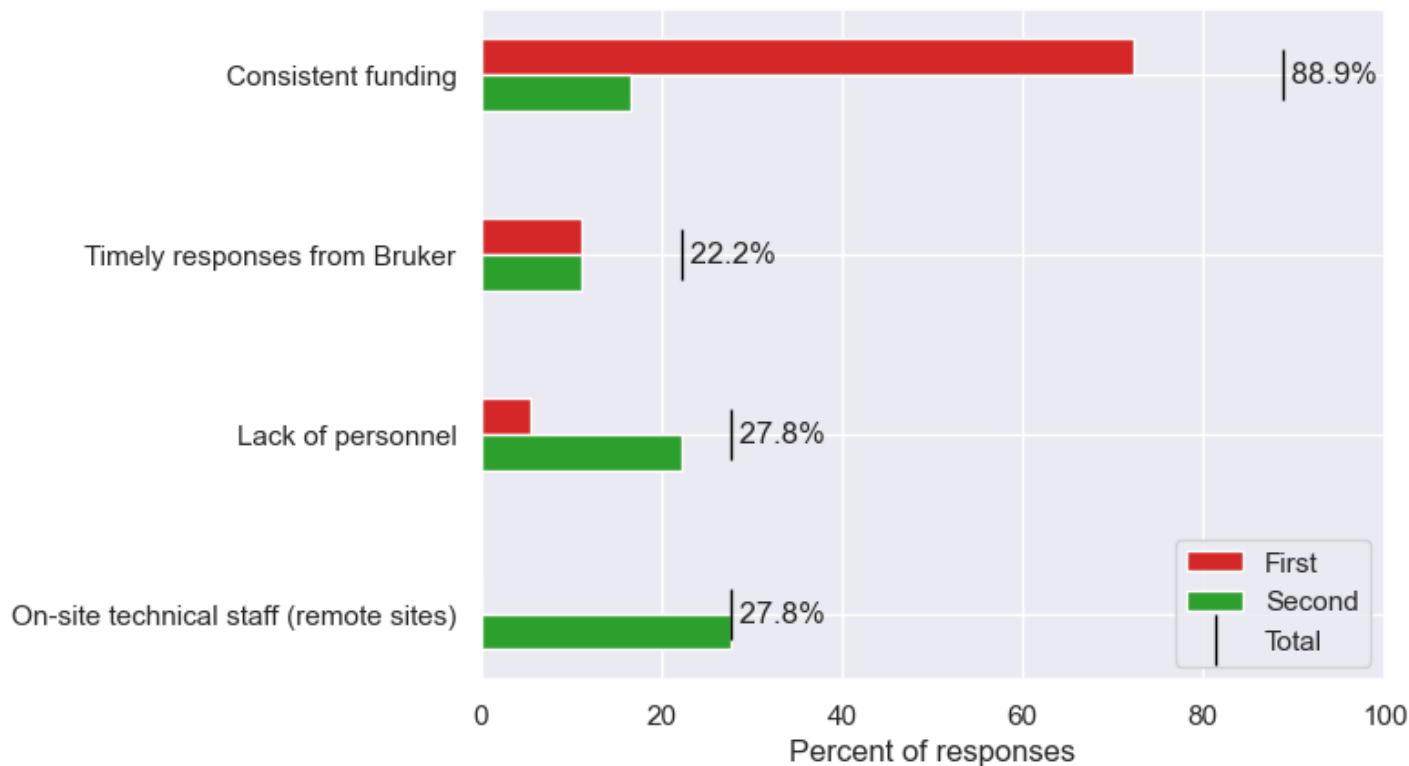
Obstacles to TCCON operation

What are the largest obstacles you face running your TCCON stations? (select all)

Obstacles to TCCON operation

Which of the previous obstacles are the two most important for each site? (select one)

Funding remains the top concern for sites

Key issues:

1. Internationality: TCCON is an international network supporting national missions

Agencies face logistical challenges in supporting TCCON sites outside of their nation. This increases the reliance of individual stations on grants obtained through their own efforts. We are investigating whether a TCCON non-profit can simplify this.

2. Continuity: TCCON is frequently funded through individual missions, but brings value when extended beyond those missions

The current funding structure raises concerns about what happens to fund and equipment when a space mission supporting TCCON ends. A mechanism to support TCCON operation between missions to ensure continuity would be beneficial.

Core network support is crucial

"Ongoing support for core TCCON operations at JPL/Caltech is critical to the entire network. This needs to be recognized by the various space agencies and should be flagged to CEOS."

- Dr. Kim Strong, University of Toronto

- The algorithm development, quality control, and other operations performed at JPL/Caltech are an essential component in making TCCON a coherent network.
- Distributing some of these capabilities throughout the network would make the network more robust, but most network personnel do not have time to take on additional responsibilities, and therefore rely on the algorithm team for support
  - Several sites expressed desire for additional algorithm support, above what is already available
- There will always be a need for a central location for data to be collected by and published from.
- **Maintaining support for these operations is critical, and currently at risk.**

Summary

- Consistent and sufficient funding to continue producing high-quality data remains the top concern among TCCON sites. As one comment says:

  "All the obstacles can be resolved with consistent, sufficient funding. Hence, the lack of funding is really the dominating issue."

- In the short term, letters of support from and representation in agencies coordinating these observations are the immediate requests.

- In the long term, assistance in establishing a mechanism to support TCCON more directly (perhaps modeled on ICOS) would better support a continuous record.

# Additional information

TCCON data processing
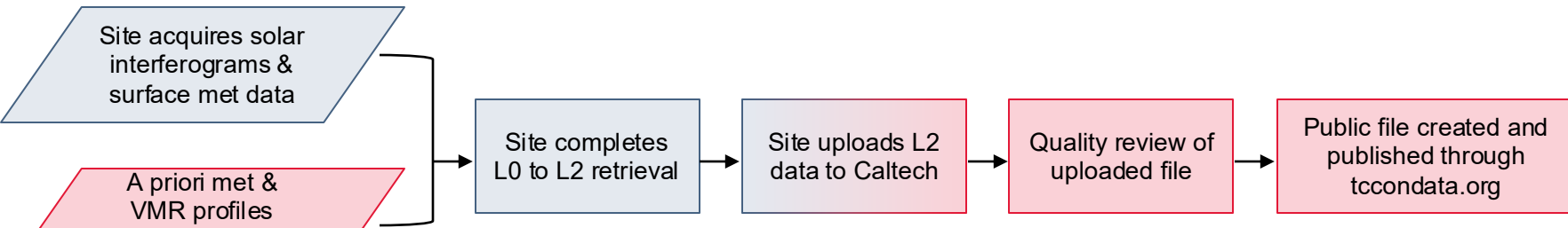
- Site personnel are responsible for operating & maintaining the instrument, processing of level 0 interferograms to level 2 column amounts, and responding to feedback during quality control
- Caltech personnel are responsible for ensuring a priori data are available in a timely manner and managing/publishing uploaded data
- Personnel from across the network contribute to quality control of the delivered data
- The algorithm co-chair and deputy ensure algorithm consistency, develop new algorithm updates, and assist the sites when needed to address retrieval issues
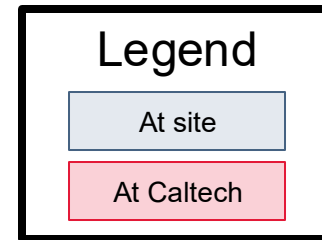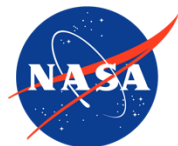
Obstacles to TCCON operation

What kinds of assistance would be helpful for securing funding? (select all)
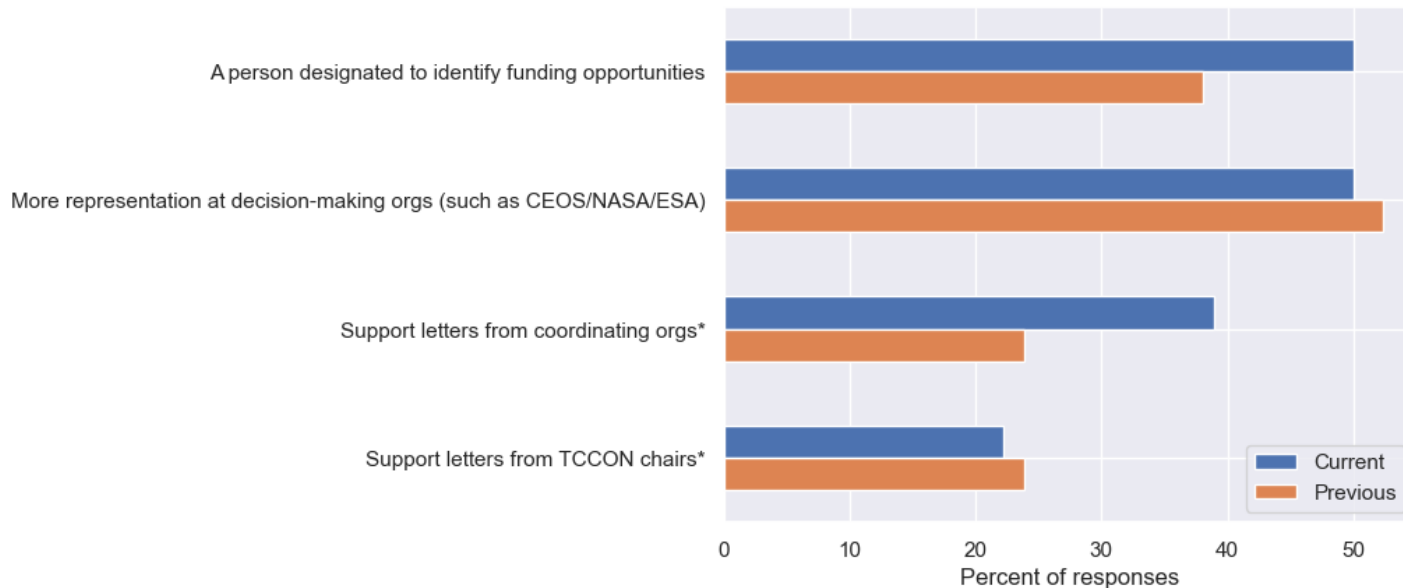
*In the previous survey, "support letters" was a single response, rather than split between the TCCON chairs and coordinating organizations. This chart assumes all respondents would have selected both options in the previous survey had it been split.

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