NASA SBG Community Webinar 2020-07-15 Question and Answer Session Summary

Q1.
Does the inclusion of a 4um band result in a higher score?

A1.
Yes. The architectures that we will present are evaluated against the AAAA/AAAA case. So the TIR architecture will score higher if the 3-5 um is included. You'll see that the recommended architecture includes 3-5 um.

Q2.
If the scoring for exceeding capability was not capped at 1, would the outcome of the ranking change from what was selected?

A2.
The relative scoring was generally quite robust to a range of alternative scoring methods including not capping at 1

Q3.
is it possible to suggest additional resources for cal/val?

A3.
Yes, both the SBG Pathfinder and the SBG Cal/Val Working Group have been maintaining a list of possible networks and field resources.

Q4.
Please define the acronyms used in the presentation: WS? NS? PB? WP?

A4.
WS = wide swath (~185km swath for the VSWIR @ 430km)
NS = narrow swath (~40km swath for the VSWIR @ 430km)
PB = push broom (~185km swath for the TIR @ 705km)
WP = whisk push (~935km swath for the TIR@ 665km)

ECOSTRESS is an example of a current whisk push. It has an array of detectors that acquire multiple pixels in the along-track direction, while scanning in the across-track direction. This allows ECOSTRESS to acquire more data in a shorter amount of time, resulting in smaller pixels and a wider swath.

Q5.
Were potential synergies with other Designated Observable missions (e.g. ACCP) identified and considered?

A5.
Yes and no. Teams have been talking to each other on a one-to-one basis. But it has been difficult to talk about formal synergies when both teams have been in a high level of flux. Once ACCP and SBG mission designs converge, then we will address synergies in greater detail. There have been extensive discussions about science overlaps, e.g. atmospheric correction and aerosols. There are plans for a joint workshop once both groups have stable primary architectures. This will mostly be restricted to discussing science, not tuning architectures, as there are too many constraints.

Q6.
Is there a suborbital SBG observing system element (beyond Cal/Val) being considered?

A6.
Yes, there has been discussion of campaigns to address event-driven needs. The overall observing system will be filled out including microsats, airborne components and importantly a ground and science data system to handle the magnitude of data.

Q7.
How will cloud-screening take place in the TIR?

A7.
Algorithms will be developed and fleshed out before the mission launches. Currently considered algorithms utilize a combination of thermal brightness temperature and 1.6 micron reflectance (which is included in the preferred TIR architecture). This has been demonstrated with ASTER and Landsat, and takes advantage of clouds being both cold in TIR and highly reflective at 1.6. All bands (VNIR multiband, 1.6 um band, and all TIR bands) will be available for cloud screening.

Q8.
Perhaps with the 2-platforms option (which is scored highest), for the VSWIR can be added a simple TIR sensor; and for the TIR, can we add a sensor with MS bands?

A8.
The recommended TIR architecture is already paired with a multiband VNIR instrument on-board. For the VSWIR, we are considering a number of small add-ons, either as small instruments or as cubesats that might trail the main sensor. This is subject to budget constraints.

Q9.
What are the equator crossing times for the recommended architecture?

A9.
VSWIR overpass is proposed to be 10:45, which will align well with CHIME. TIR proposed overpass will be at 13:30, which aligns with LSTM proposed crossing time.

Q10.
Will the TIR element in the recommended architecture align with TRISHNA?

A10.
Yes for the most part, although the instruments may have slightly different band positions, spatial resolutions and revisit times. Band positions and spatial and temporal resolutions have not yet been finalized for either instrument.

Q11.
Will there be a single-band TIR channel with the VSWIR instrument for cloud masking?

A11.
There is not currently a plan to include a TIR channel with the VSWIR instrument. However, we are considering small add-ons, subject to budget constraints.

Q12.
Will spatial resolution(s) also be harmonised with CHIME/LSTM?

A12.
CHIME is converging on 30m spatial resolution, which matches the proposed architecture for SBG-VSWIR. There have already been SBG-CHIME discussions by engaging the metrology agencies in US and Europe to aid in pre-launch calibration. There was agreement that these groups provide an increased level of rigorousness and intercomparability.
It is less clear where the LSTM targeted launch readiness is. The exact spatial resolutions have not been confirmed but they are <100m, which is consistent with SBG-TIR recommended architecture.

Q13.
How will you deal with band-to-band co-registration?

A13.
It is critical that band-to-band co-registration and calibration are treated carefully for an instrument used for spectroscopy. The CVWG has considered this and it is a priority. For example, one option for band-to-band registration is through lunar calibration.

Q14.
Will the SBG TIR system acquire data at night?

A14.
Yes, these are all sun synchronous platforms so there will be a day and night overpass.

Q15.
Please elaborate on the comment regarding the constellation alternative architecture that there is "unknown ability to make 5 or 7 VNSWIR instruments and calibrate them against each other". Is that related to cost, instrument complexity, operations?

A15.
The unknown ability to make several calibrated instruments relates to all three – cost, complexity and operations. Imagine looking for change across a landscape and are stitching together images from multiple sensors. We don't know how well we can calibrate and correct and fuse the images. The primary mission goal is to detect and quantify change. Constellations provide high value in establishing record over time, but has added complexity of multi-instrument cross calibration. We will be exploring constellation components and elements. There's a potential for a pathfinder to retire risk in the multi-satellite area

Q16.
What are the considerations regarding sunglint avoidance?

A16.
We are aware that this is an issue that we'll have to take into account. Sunglint hasn't defined architecture choices at this phase because all the recommended spacecrafts are agile. This topic will be considered in more detail during pre-Phase A and Phase A.

Q17.
What would the approximate spectral and signal-to-noise ratio of the cubesat VSWIR instrument compared to the main instrument? (and spatial resolution if different from the main instrument)?

A17.
TBD. However, the community has expressed strong desire for highest possible SNR and spatial resolution in the 30-60 m range. NASA Ames is looking at the instrument design.

Q18.
Will there be point and stare capability? This seems optimized for mapping. Which I think is great, but pointing was considered early on so I wonder about the outcome.

A18.
We have not considered this in detail yet, since all instruments we've considered are agile and could likely accommodate this.

Q19.
What will the data volumes be?

A19.
Downlinked data volumes for the VSWIR elements were estimated at ~10 Tb per day, which is as large as any mission currently under consideration (e.g. NISAR). We are considering a cloud-based data system, which would enable product generation globally or on demand, but this will likely require innovation. Distributed products will have smaller volume.

Q20.
A multi-spectral instrument always confuses snow and clouds, particularly at high elevations. We cannot discriminate all snow from all clouds with just the radiometric signal. This applies to TIR as well.

A20.
For a VSWIR spectrometer, existing algorithms are able to mask clouds, even over snow-covered terrain. For the TIR, the algorithm currently under consideration is similar to that used by Landsat and ASTER, using the 1.6um band (included in the preferred architecture) and the thermal brightness temperatures, leveraging the fact that snow is bright in the SWIR and also cold in the TIR (https://doi.org/10.1029/2008GL034644). However, we recognize that there may be confusion over snow, particularly at high elevations. One suggestion has been to incorporate texture into our cloud detection algorithm, and this will be investigated. The algorithms will continue to be developed until launch, and we wouldn't want to restrict ourselves by using old algorithms if newer and better methods become available.

Comments:

The outcome seems very robust for the potential science!

Overall, I think it was a good process.

For characterization of vegetation functional traits it will be beneficial to observe simultaneously VSWIR with TIR.