Biomass mission coordination and data uptake
LSI-VC-8
S Ward, Sep 2019
• Substantial investment ($4Bn+!) in biomass-related mission launches 2018-2024
• Strong interest in biomass from sectors related to carbon emissions and forests
• Need to optimise the policy relevance of the space data - through fora such as GFOI and World Bank
How will scientists make sense of many of the data products?

How will policy makers?
### Biomass data

Many current and upcoming missions will provide data that will be used to map biomass

<table>
<thead>
<tr>
<th>Mission</th>
<th>Funding Agency</th>
<th>Expected Launch Date</th>
<th>Data Type</th>
<th>Geographic Domain</th>
<th>Biomass Product Resolution</th>
<th>Accuracy Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALOS-2</td>
<td>JAXA</td>
<td>2014</td>
<td>L-band SAR</td>
<td>Global</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>ICESat-2</td>
<td>NASA</td>
<td>Sept 15, 2018</td>
<td>532 nm photon counting lidar</td>
<td>Global</td>
<td>NA</td>
<td>Global</td>
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<tr>
<td>SAOCOM 1A</td>
<td>CONAE</td>
<td>October 8, 2018</td>
<td>L-band SAR</td>
<td>Global</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>GEDI</td>
<td>NASA</td>
<td>Dec 5, 2018</td>
<td>1064 nm waveform lidar</td>
<td>ISS (+/- 51.6°)</td>
<td>1 km</td>
<td>&lt;20% SE for 80% of forested 1 km cells</td>
</tr>
<tr>
<td>SAOCOM 1B</td>
<td>CONAE</td>
<td>October 2019</td>
<td>L-band SAR</td>
<td>Global</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>ALOS-4</td>
<td>JAXA</td>
<td>2021</td>
<td>L-band SAR</td>
<td>Global</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>NISAR</td>
<td>NASA/ISRO</td>
<td>2021/2022</td>
<td>L/S-band SAR</td>
<td>Global</td>
<td>1 ha (&lt;100 Mg/ha)</td>
<td>&lt;20% RMS accuracy for &lt;100 Mg/ha</td>
</tr>
<tr>
<td>BIOMASS</td>
<td>ESA</td>
<td>2022</td>
<td>P-band SAR</td>
<td>Global (excl. N. America &amp; Europe)</td>
<td>4 ha</td>
<td>Accuracy of 20%; 10 Mg/ha for &lt;50 Mg/ha</td>
</tr>
<tr>
<td>MOLI</td>
<td>JAXA</td>
<td>~2022</td>
<td>1064 nm waveform lidar</td>
<td>ISS (+/- 51.6°)</td>
<td>500 m</td>
<td>NA</td>
</tr>
<tr>
<td>TanDEM-L</td>
<td>DLR</td>
<td>2022-2023?</td>
<td>L-band SAR</td>
<td>Global</td>
<td>1 ha</td>
<td>20% accuracy or 20 Mg/ha</td>
</tr>
</tbody>
</table>
• Many international policies requiring biomass information adopted in recent years.
• Multilateral agreements & performance-based incentive systems to curb trends in forest loss in tropics
• International negotiations related to climate change
• Voluntary international processes and their targets related to forests:
  – UN Forum on Forests
  – Aichi targets under the UN convention on Biological Diversity
  – 2011 Bonn Challenge to restore 150 million hectares of degraded land by 2020
  – 2014 New York Declaration
  – Land degradation neutrality target UN Convention to Combat Desertification
  – UNFCCC NDCs, and the related Sustainable Development Goals (SDGs).
• Biomass measurements are of particular significance for policies related to the UNFCCC, because countries must monitor emissions related to gains and loss of biomass, and must report on these regularly
• T12 is Above Ground Biomass (AGB)
• GCOS highlights the further need for actions to:
  – Encourage inter-agency collaboration on developing methods to combine biomass estimates from current and upcoming missions (GCOS Action 52)
  – Encourage inter-agency collaboration to develop validation methodologies (GCOS action 53)
  – Develop a set of validation sites covering the major forest types, particularly in the tropics (GCOS action 54)
  – Promote access to well-calibrated and validated regional- and national-scale biomass maps including uncertainty assessment (GCOS action 55)
  – Improve access to high-quality forest inventories, especially in the tropics, which can be used for research purposes and Reducing emissions from deforestation and forest degradation plus (REDD+) (GCOS action 56)
Possible joint objectives

- Explore how CEOS groups and agencies might work together to accelerate the policy relevance of the new generation of above ground biomass datasets
  - **gather, synthesize, and communicate user requirements** of forest biomass data and space-based AGB data products - that meet user needs, support forest monitoring and wider land use management applications and improve environmental policy to enable countries to help meet international climate and sustainable goals.
  - **stimulate uptake of biomass data** by key stakeholders. integration of biomass products in climate/vegetation models is already progressing (i.e. ESA Biomass CCI: http://cci.esa.int/), but there has been little progress in demonstrating how biomass mapping from space can be integrated in national forest monitoring and national GHG inventories efforts.
  - **promote collaborative and sustained data provision**
    - avoid a widening gap between what is evolving in research and from space-based missions, and the diverse demands of users, particularly in terms of the need for operational systems.
## Future Biomass Framework

### Data Component
(Country Needs Assessment, data accessibility, in-situ data, validation, country link and international policy link)

### R&D
(Biomass Expert Meetings, funding opportunities for gap filling)

### MGD
(Emission Factors, maturity assessment)

### CB
(Capacity Building related to biomass estimation)

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### LSI VC
SDCG / Forest SG
Multi-mission user interaction and data strategy, facilitate data uptake

### WGCV
LPV
Biomass Product Calibration, Cross-calibration, Validation Protocol

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### Space Agencies

- **Biomass related Missions**
  - **BIOMASS**
  - **Sentinel L-Band** (Copernicus Extension - TBD)
  - **GEDI**
  - **NISAR with ISRO**
  - **ICESat-2**
  - **MOLI**
  - **SAOCOM-1**
  - **SAOCOM-2**
  - **ALOS-2**
  - **ALOS-4**

- **TanDEM-X (Δ-DEM)**
- **TanDEM-L (Phase-A study)**
- **NovaSAR (Case study)**
Possible joint objectives

• Biomass mission coordination implemented through an informal multi-mission group, with close ties to WGCV/LPV but not formally recognised in the CEOS structure
  – product and cal-val focus (GCOS requirements)
• Would agencies benefit from recognition of the challenges within a CEOS Virtual Constellation framework, and should that be LSI-VC or a standalone VC?
  – JAXA, NASA, ESA, DLR, CONAE, ISRO fly the missions
  – definitely at the research end of a VC and not operational
  – land surface, not strictly imaging
  – CARD4Lidar?
  – could be embedded within new Forest & Biomass team
  – GEOGLAM/Ag will have interest in aspects also
• How might we take advantage of the coming SIT term to kick-start any cooperation and establish CEOS Principal attention & support?
• Getting traction within LPV/Biomass group... NASA, ESA Principals?