The GlobBiomass Algorithm Technical Basis Document (ATBD) - Conclusions

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Inputs from the whole team

Conclusions 1

- The regional and global biomass mapping methods represent both the data available and the varying experiences of the team.
- A key factor is *in situ* data: where there are large amounts of *in situ* data from forest inventory, data-driven methods, such as kNN, can be developed, but otherwise (as for the global product) a model-based parametric approach is needed.
- Sweden provides an interesting test-case, since both methods can be applied.
- The key dataset in all the regional methods is ALOS-PALSAR.
- ALOS-PALSAR data are also very important to the global product but it already has a strong backbone from biomass maps of the N boreal and temperate forests derived from C-band data.

Conclusions 2

- For the model-based approaches, information provided by optical sensors, such as land cover and forest density, is essential for parameterisation; such data are also exploited in the Mexican product.
- DEM data from SRTM are important in many cases, both to correct for terrain effects and to mask areas of steep terrain. The global product also uses a wide variety of auxiliary datasets.
- An outstanding question is whether any of the approaches can circumvent the well-known saturation of L-band data at higher biomass levels: this is particularly relevant for dense tropical forest, which is a key biome where good biomass information is needed.

Conclusions 3

- For the tropics, a particular challenge for GlobBiomass is to demonstrate that its products are superior to the pan-tropical maps already available from Saatchi et al. (2011), Baccini et al. (2012) and their fusion in Avitabile et al. (2015) (noting that improved maps are already available from Saatchi).
- The relation between accuracy and the scale is an unresolved issue. Although PALSAR data allows biomass estimates within 25m pixels, but adequate accuracy will require spatial averaging. As an example, BIOMASS data will be 6-look with a ground resolution of ~50m, but recovering biomass to an accuracy of 20% will only be possible at the scale of 4 ha (200m x 200m).

Conclusions 4

- The reporting of accuracy still needs to be clarified:
  - Underlying most of the analysis of accuracy is the assumption that the biomass estimates are **unbiased**, so that accuracy can be estimated in terms only of a zero-mean variation about the true value. (So the variance of the total error due to independent error contributions is given by summing the individual variances.)
  - For signals that saturate (e.g. L-band data for large biomass), there is a serious risk that estimates will be biased over part of the biomass range.
  - Bias cannot be removed by spatial averaging and is an intrinsic error. Hence a crucial concern for all the products must be to assess whether the methodology is likely to lead to biases and whether such biases can be quantified and removed.

Conclusions 5

› We can expect significant changes and two-way improvements when we begin comparisons between regional and global products.