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| **Type the title of your abstract:** **Comparing aboveground biomass density maps derived from airborne lidar, satellite lidar, radar, and multispectral data across forested lands in Oregon, USA** |
| **Introduction/Aim:** Stakeholders need mapped aboveground biomass density (AGBD) estimates to inform forest management and planning decisions at multiple jurisdictional scales ranging from forest stands to landscapes, regions, and nations. Other needs are for accuracy, precision, repeatability, and transparency, such that the mapped AGBD estimates can be considered unbiased with respect to National Forest Inventory (NFI) plot data, to enable objective monitoring of forest carbon pools and fluxes to meet carbon monitoring, reporting and verification requirements in accordance with international agreements for greenhouse gas mitigation. Associated with these maps, stakeholders also need robust estimates of uncertainty to make informed decisions. An emerging challenge for stakeholders is choosing an AGBD map to use from among the number of AGBD maps increasingly available. Our objective was to compare the precision (RMSE) and accuracy (BIAS) of AGBD maps produced from different remote sensing datasets or using notably different methodologies. **Methods:** We compared ten AGBD products across the western US state of Oregon, which features a remarkable diversity of forest conditions across multiple jurisdictions. We subset global, national, or regional wall-to-wall AGBD products to the same, more limited spatial extent of AGBD map products derived from airborne laser scanning (ALS) data that are widely regarded as the best available remote sensing technology for mapping AGBD, with broad coverage available across most of the forested portions of Oregon. The AGBD map years ranged from 2000-2020, so we applied a 2009 forest/non-forest mask to all the AGBD maps considered, such that any AGBD estimates on potentially non-forest lands were excluded from consideration. We calculated the means of the remaining forest AGBD raster estimates, with resolutions ranging from 30m to 1000m, to 3 polygon scales of aggregation: counties of irregular shape and nominally large size, NFI sample hexagon tessellations of consistent, intermediate size (64,000 ha), and forest stand maps of irregular shape and small size. At the 2 larger polygon scales, NFI plot estimates could be summarized annually for ground-based validation. At the stand level, ground-based estimates for the same forest stands were obtained from the US Forest Service FSVeg database, which is collected largely ad hoc, i.e., not following a systematic sampling design like NFI plot data.**Results:** The ten AGBD maps considered were remarkably consistent for their precision; RMSE ranged from 56-68 Mg/ha, with lidar and multispectral image derived maps being more precise than those derived using radar. The BIAS statistic revealed more notable differences in accuracies, with the radar maps tending to underpredict AGBD by 12-35 Mg/ha and the AGBD maps derived using an ecosystem demography model tending to overpredict AGBD by 31-40 Mg/ha.**Conclusion:** Results confirmed the importance of calibrating the AGBD estimates using unbiased NFI data during mapmaking. The trends observed in the stand-level analysis were the same as trends observed at the county and NFI sample hexagon levels, confirming that ground estimates are useful for validation, even if they may be unsuitable for model calibration because they do not follow a robust sampling design and/or lack spatial precision and accuracy.  |

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