Global Processing of ALOS-2 L-band Backscatter for CCI Biomass
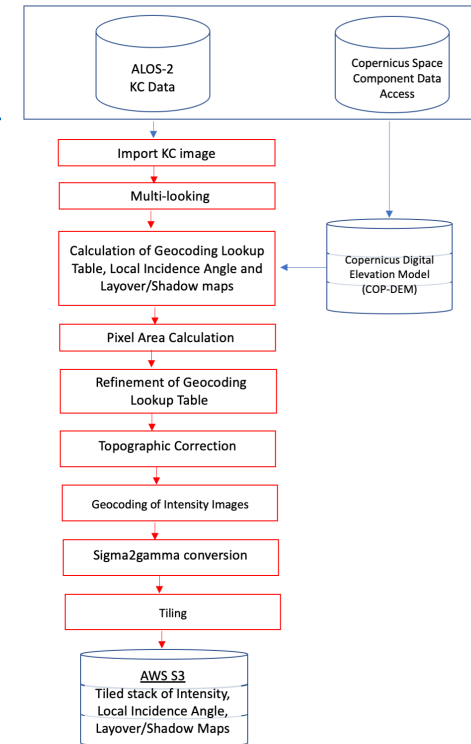
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GAMMA REMOTE SENSING

EARTH BIG DATA
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Introduction

The ESA Climate Change Initiative (CCI) Biomass project (https://climate.esa.int/en/projects/biomass/) has produced global forest aboveground biomass maps at hectare-scale resolution for the years 2010, 2017, and 2018 using ENVISAT ASAR and Sentinel-1 C- and ALOS-1/ALOS-2 PALSAR L-band SAR backscatter data and will continue to produce new maps for additional years between 2015 and 2021. The annual ALOS-1/-2 Fine-Beam (FB) and per-cycle ScanSAR mosaics provided by JAXA allowed for significantly improving the accuracy of the maps in particular over dense forests reaching high biomass levels. However, the availability of only one observation per year from the Fine-Beam mosaics limited the performance of the biomass retrieval outside of the tropics where no ScanSAR data was available. In support of the CCI Biomass project, JAXA has kindly provided access to all individual ALOS-2 FB acquisitions in detected slant-range KC format, which are now being processed by the CCI Biomass consortium to radiometrically-terrain-corrected level.

Processing

A pre-processing chain was implemented on Amazon Web Services (AWS) (AWS Facility in Tokyo) based on the GAMMA software (www.gamma-rs.ch) and the cloud-scaling solutions developed by Earth Big Data LLC (earthbigdata.com). The processing chain (Figure 1) allows for efficient processing of a complete annual coverage in few hours.

Pre-processing aims at producing fully calibrated and terrain-corrected backscatter data at 0.00088888° resolution (EPSG:4326), which is the target resolution of CCI Biomass products. The processing comprises compensation for the Noise Equivalent Sigma Zero (NESZ), topographic corrections according to Frey et al. (2013), and a verification of the geocoding accuracy for each individual scene (on average few tenths of a pixel).

Figure 1. Processing workflow.

Status

All data acquired in 2019/20 have been processed as of November 2022. Annual composites for the years 2019/20, which have been produced for illustrational purposes only with the per-pixel mean of all observations, are shown in Figure 2. Processing of the remaining years of ALOS-2 FB data (2015, 16, 17, 18, 21) is foreseen to be completed by the end of this year.
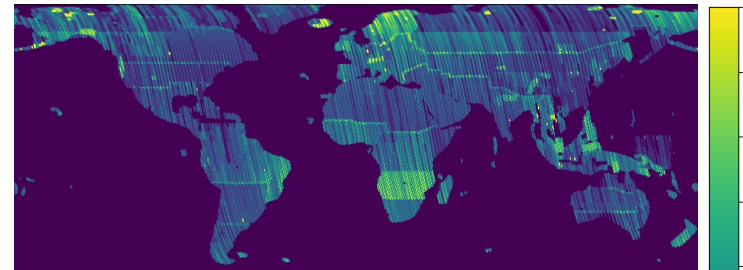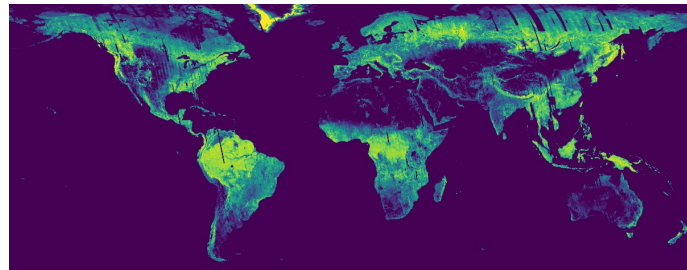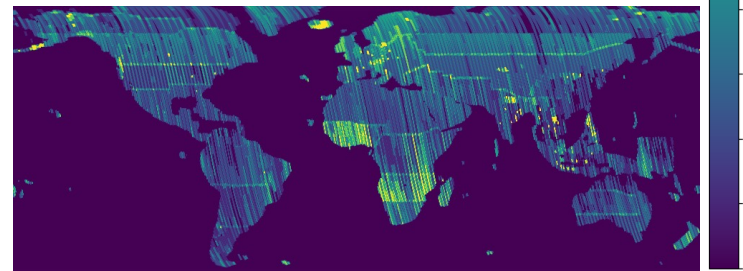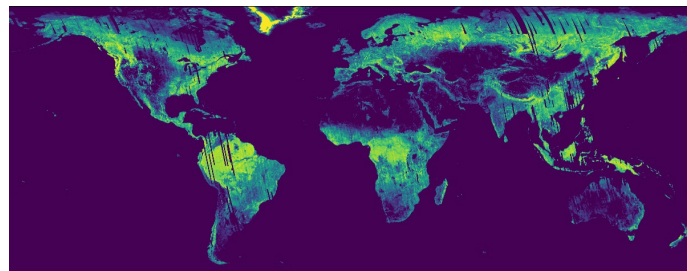

Figure 2. Annual mean L-HV backscatter calculated from all ALOS-2 Fine Beam dual-polarization data acquired in 2019 (top left) and 2020 (bottom left).