FOREST MAPPING WITH ALOS PALSAR MOSAICS IN SNAP

Data: ALOS PALSAR L-band mosaics:
(original source: https://www.eorc.jaxa.jp/ALOS/en/palsar_fnf/data/index.htm)

- S06W056_07_sl_HH_db.tif
- S06W056_07_sl_HV_db.tif
- S06W056_10_sl_HH_db.tif
- S06W056_10_sl_HV_db.tif

1. Open file
   1.1. File / Open Product… (use control key to select multiple files)

2. View world map
   2.1. View / Tool Windows / World Map
   2.2. Select magnifying glass icon to zoom to image footprint
   2.3. Use mouse wheel and left click to zoom and pan respectively

3. View image single bands
   3.1. Select "Bands" folder in "Product Explorer" window and view each band by double clicking on band name.

4. View multiple viewers
   4.1. Synchronise views by selecting the relevant icons in the "Navigation" tab
   4.2. Select: Window / Tile Horizontally
   4.3. Compare PALSAR backscatters in HH and HV polarizations

5. Create layer stack
   5.1. Raster / Geometric Operations / Collocation
   5.2. Select Master Product: backscatter in HV polarization
   5.3. Select Slave Product: backscatter in HH polarization
   5.4. Define the target name: e.g.,"S06W056_07_sl_HV_HH_db"
   5.5. Rename master components: ${ORIGINAL_NAME}_HV
   5.6. Rename master components: ${ORIGINAL_NAME}_HH
   5.7. Select "Run"

6. Calculate HH/HV ratio
   6.1. Raster / Band Maths / Edit Expression
   6.2. Select band_1_HH, select @ / @, select band_1_HV. In the expression window you should have band_1_HH / band_1_HV.
   6.3. Select "Ok"
   6.4. Save the newly created virtual band to actual band by right clicking on the band and selecting "Convert band"

7. RGB image view
   7.1. Window / Open RGB Image Window
   7.2. Select the following bands: Red = band_1_HH, Green = band_1_HV, Blue = ratio_HH_HV
   7.3. Contrast stretch the images: Colour Manipulation tab, move triangular sliders to either side of the histogram for each R, G and B channel. Or you can stretch the RGB values to 95% distribution (ignore extreme min and max values) by clicking "95% butto" in the Color Manipulation tab.

8. Filter speckle
   8.1. Radar / Speckle Filtering / Single Product Speckle Filter
   8.2. In the "Processing Parameters" tab, select the "band_1_HH", "band_1_HV" and "ratio_HH_HV" bands in the "Source Bands" list (using the control key with the left mouse button to select both simultaneously).
   8.3. In the "Filter" dropdown box, select "Lee"
   8.4. In "Filter Size X:" and "Filter Size Y:" select 5, and 5 respectively.

8.5. Select "Run"

9. Compare speckle filtered and non-speckle filtered images
   9.1. Window / Tile Horizontally, then link viewers in the "Navigation" tab
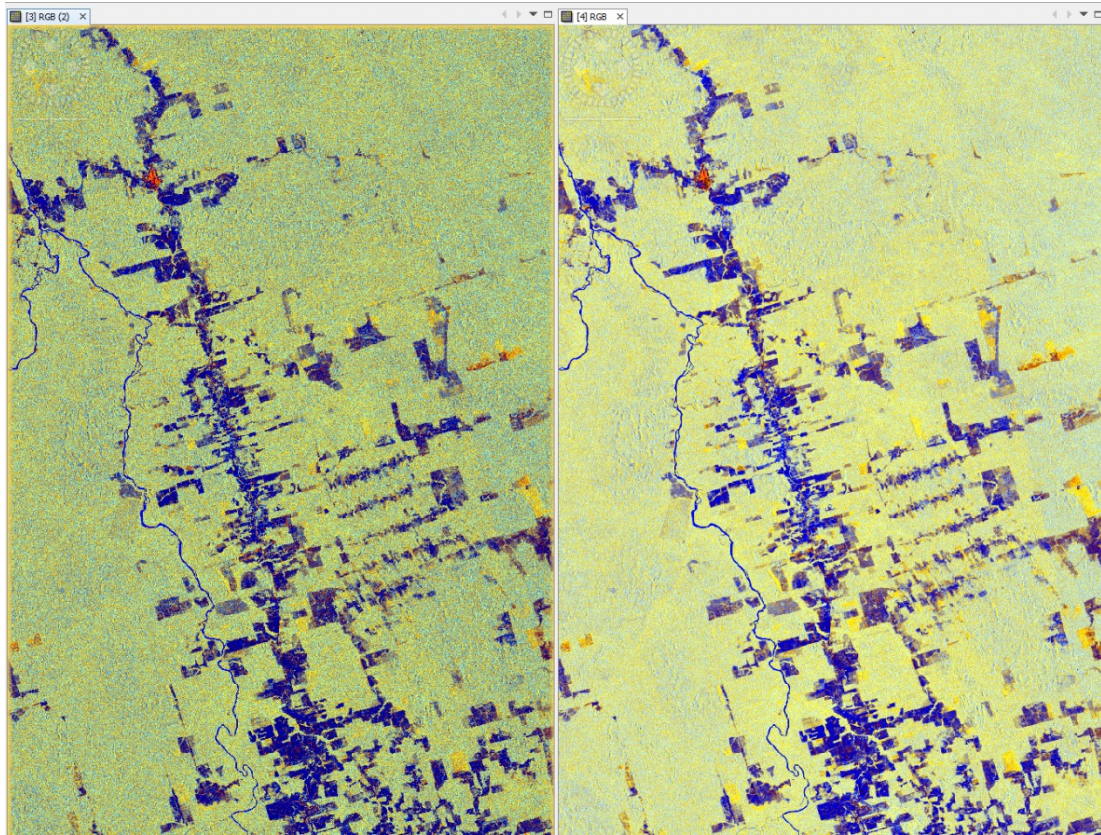
10. To extract area covered by forest, we will apply a simple threshold to HV backscatter
    10.1. Select "Pixel Info", move mouse icon over forested areas to find a suitable threshold value
   10.2. Then mask out the areas by selecting Raster / Band Maths / Edit Expression. In the "Expression" window, type "if band_1_HV < -15 then 0 else 1".
    10.3. Save the newly created virtual band to actual band by right clicking on the band and selecting "Convert band"

11. Repeat the steps 5-10 for ALOS PALSAR data from 2010

12. Compare forest masks from 2007 and 2010
    12.1. Window / Tile Horizontally, then link viewers in the "Navigation" tab
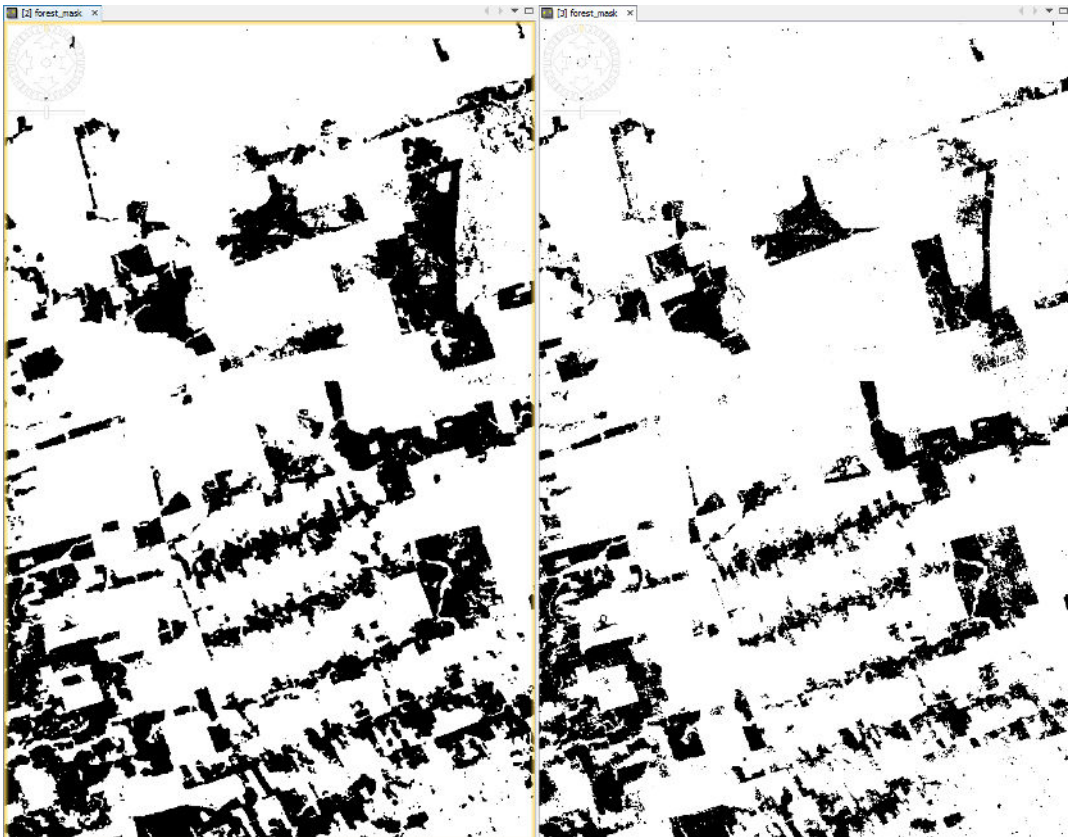
13. Create layer stack between the data from 2007 and 2010
    13.1. Raster / Geometric Operations / Collocation
    13.2. Select Master Product: data from 2007
    13.3. Select Slave Product: data from 2010
    13.4. Define the target name: e.g.,"S06W056_07_10_forest_mask"
    13.5. Rename master components: ${ORIGINAL_NAME}_2007
    13.6. Rename master components: ${ORIGINAL_NAME}_2010
    13.7. Select "Run"

14. Difference between forest mask 2007 and forest mask 2010
    14.1. Raster / Band Maths / Edit Expression
    14.2. Select forest_mask_2007, select @ - @, select forest_mask_2010. In the expression window you should have forest_mask_2007 - forest_mask_2010.
    14.3. Select "Ok"
    14.4. Save the newly created virtual band to actual band by right clicking on the band and selecting "Convert band"
    14.5. Compare forest masks from 2007, 2010 and the difference product: Window / Tile Horizontally, then link viewers in the "Navigation" tab. In the difference product 1 value indicates new clear-cuts