Forest Fires in Brandenburg, Germany: Calculation of Differential Normalized Burn Ratio (dNBR) with QGIs and Sentinel2 imagery

Lysander Rohringer

Background & Location

During 2017-2019 large forest fires occurred with varying fire intensity from ground fire to crown fire in east Germany. Landscape is shaped by reclaimed marshland mainly pine-dominated forests on dry and poor sites in Treuenbrietzen, Jüterbog and Lieberoser Heide.

<table>
<thead>
<tr>
<th>Fire Year</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treuenbrietzen</td>
<td>0 ha</td>
<td>334 ha</td>
<td>0 ha</td>
</tr>
<tr>
<td>Jüterbog</td>
<td>0 ha</td>
<td>255 ha</td>
<td>744 ha</td>
</tr>
<tr>
<td>Lieberose Heide</td>
<td>250 ha</td>
<td>340 ha</td>
<td>100 ha</td>
</tr>
<tr>
<td>Total</td>
<td>250 ha</td>
<td>1229 ha</td>
<td>1074 ha</td>
</tr>
</tbody>
</table>

Tab 1: Shows area size of burnt landscape

Method

- The fire period (beginning and end) is determined via news, fire departments or other source.
- Sentinel2 satellite imagery (as little clouds and interference as possible) of pre- and postfire for SWIR- and NIR-bands were accessed used in the resolution of 10m
- Calculation of pre- and postfire-NBR via QGIS Raster Calculator by the following formula:

  \[ NBR = \frac{NICR - SWIR}{NIR + SWIR} \]  

  A high NBR value indicates healthy vegetation while a low value indicates bare ground and recently burnt areas.

  - Calculation of dNBR via Raster Calculator:

  \[ dNBR = p\text{refireNBR} - p\text{ostfireNBR} \]  

  - Classification of the raster differences according to the severity of the burn with the dNBR classification table

Results

The fire spread beyond the main road and railway moat and caused crown fire with high burn severity impact in the northeast part. A meandering line with unburned trees crosses from southwest to northeast.

In the southern part was the strongest burn severity. Northwest fires were in marshlands and around lakes. Jüterbog had the most moderate burn severities compared with the other areas.

Outlook

1. The method to calculate the dNBR by choosing this data manually is accurate but time consuming. This procedure requires the fire period beforehand, which is simple to implement in populated areas like Germany. Especially here, the fire management is well organised.

2. However, most of the losses due to forest fires occur in rural areas. Here it would be useful to work with a reusable and automated analysis method, that creates the dNBR for any area of interest (AOI) even without knowing the fire period for example.