Evaluation of Filters and Filtering Windows in SAR Data for Detecting Fire Degradation in the Tapajós National Forest

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1. INTRODUCTION

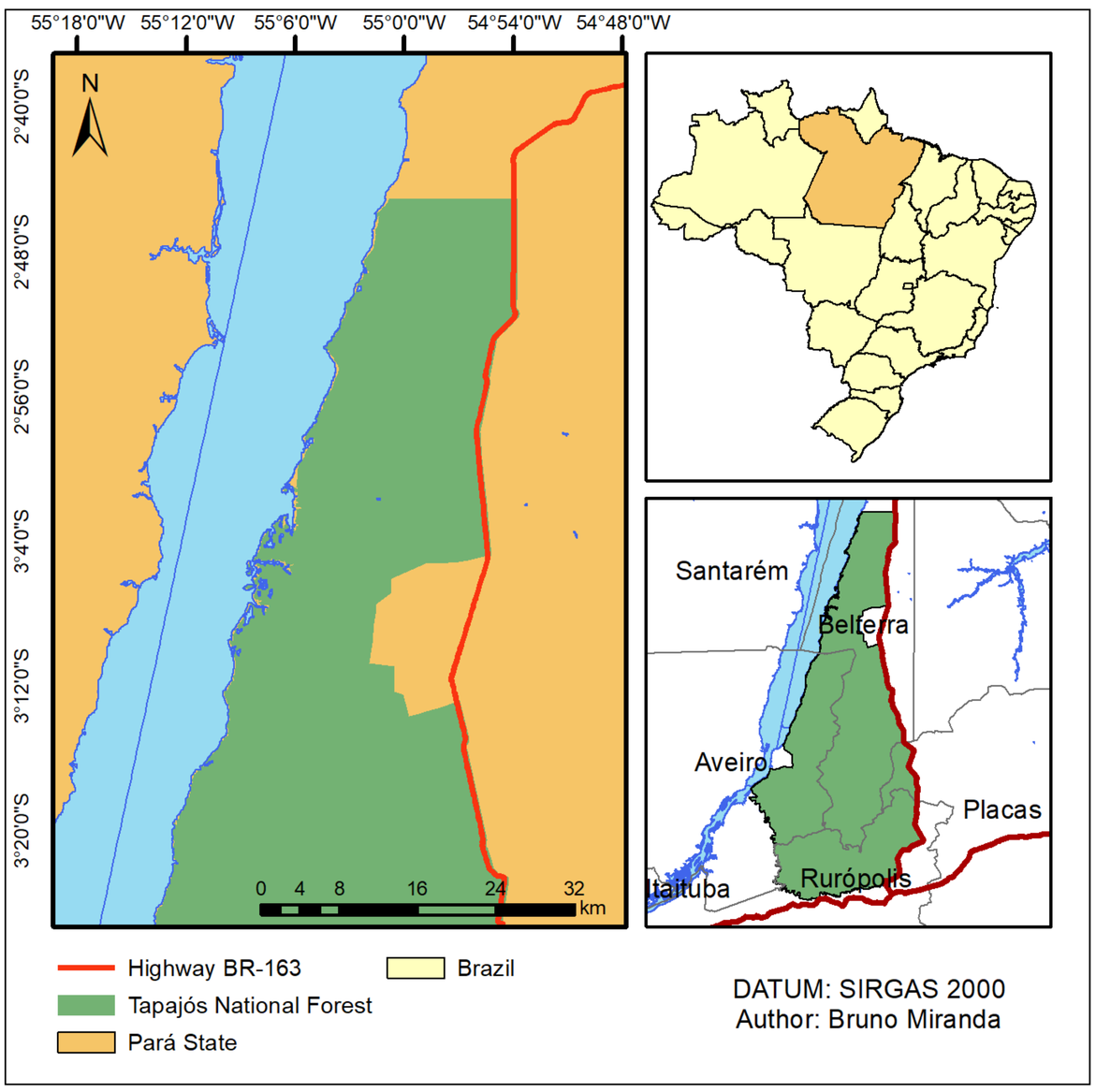
- The biome has been strongly influenced by humans, becoming a frontier for agriculture, mining and livestock exploration since the 1940s.
- It is necessary to implement preventive measures within the scope of envinromental monitoring of the biome.

2. JUSTIFICATION AND OBJECTIVE

- Use of SAR for adverse weather conditions in tropical regions, e.g. clouds and fog + independence from sunlight.
- The objective of this study is to evaluate the performance of different filters and filtering windows of ALOS-2/PALSAR-2 images to detect areas of forest degradation caused by fire.

3. STUDY AREA

Figure 1: Location of the study area



4. MATERIAL AND METHODS

- Two multitemporal ALOS-2/PALSAR-2 images in SM2 mode and quadruple polarization (HH, HV, VH and VV) and L1.1.
- The step-by-step of the methdology is described by: i. multilooking technique; ii, application of the Lee, Gamma and Sigma Lee filters with differente windows, aiming the effective treatment of the Speckle noise.

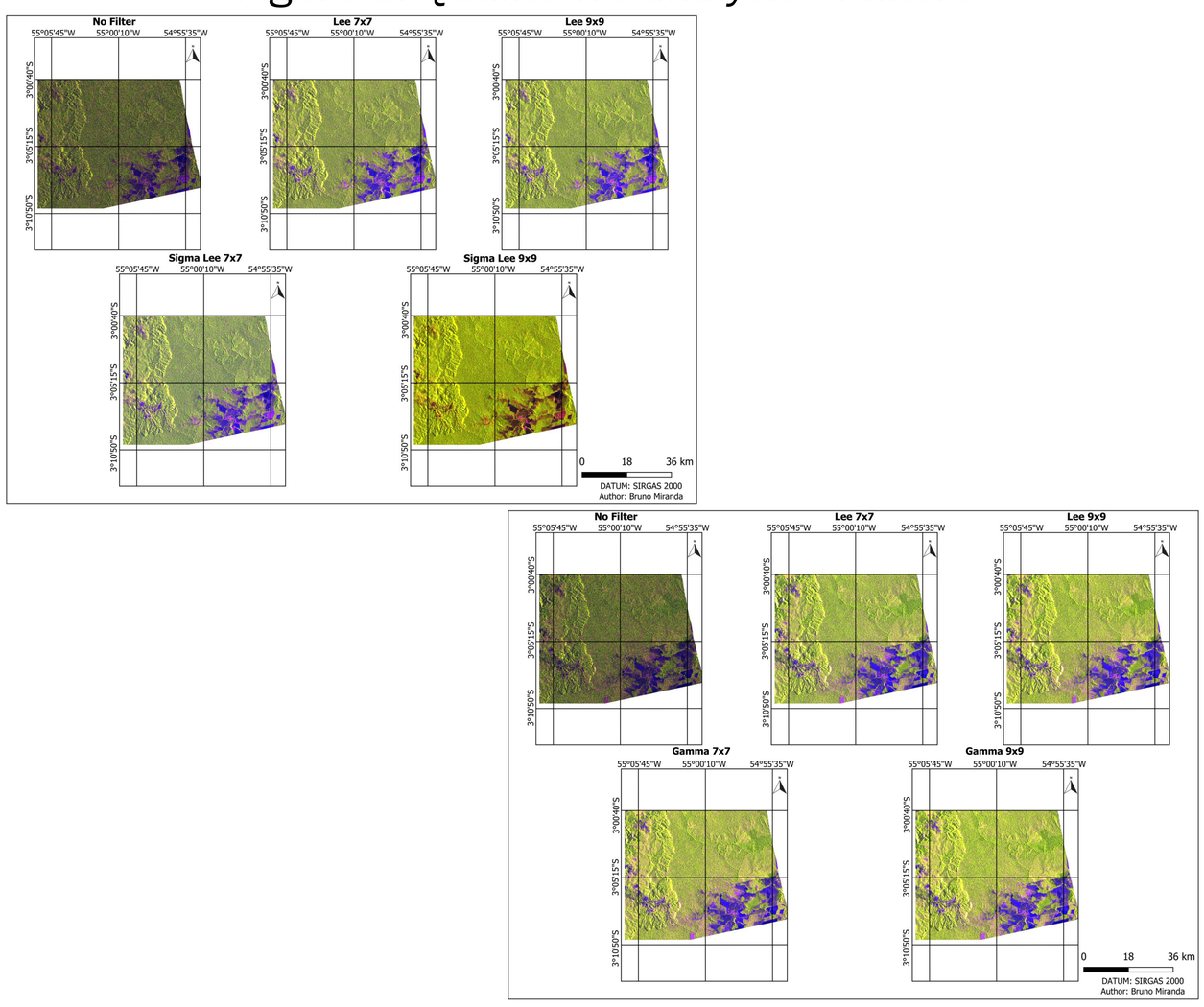
5. RESULTS

Figure 2: Quantitative analysis of filters

Coefficient of Variation: ALOS-2/PALSAR-2 (03/05/2015)					
Filtering Window	HH	HV	VH	VV	% Mean Change
No Filter	1.2965	1.2890	1.2898	1.2008	-
Lee 3 x 3	1.0160	1.0232	1.0241	0.9301	21.35
Lee 5 x 5	0.9047	0.9185	0.9193	0.8151	29.95
Lee 7 x 7	0.8640	0.8739	0.8748	0.7707	33.39
Lee 9 x 9	0.8448	0.8479	0.8489	0.7524	35.15
Gamma 3 x 3	1.0269	1.0329	1.0338	0.9393	20.57
Gamma 5 x 5	0.9198	0.9245	0.9254	0.8250	20.57
Gamma 7 x 7	0.8856	0.8754	0.8764	0.7805	32.71
Gamma 9 x 9	0.8709	0.8459	0.8469	0.7888	33.96
Sigma Lee 5 x 5	1.0585	0.9848	0.9859	0.9629	21.33
Sigma Lee 7 x 7	1.0279	0.9457	0.9470	0.9269	24.18
Sigma Lee 9 x 9	1.0106	0.9233	0.9247	0.9081	25.78

Coefficient of Variation: ALOS-2/PALSAR-2 (01/05/2016)					
Filtering Window	HH	HV	VH	VV	% Mean Change
No Filter	1.6980	1.3092	1.3098	1.6635	-
Lee 3 x 3	1.2356	0.9946	0.9950	1.1896	25.95
Lee 5 x 5	1.1962	0.9390	0.9395	1.1555	29.16
Lee 7 x 7	1.1064	0.8943	0.8949	1.0519	33.74
Lee 9 x 9	1.0715	0.8686	0.8691	0.9960	36.08
Gamma 3 x 3	1.2445	0.9985	0.9987	1.1992	25.53
Gamma 5 x 5	1.0882	0.9108	0.9114	1.0262	33.77
Gamma 7 x 7	1.0210	0.8704	0.8708	0.9491	37.46
Gamma 9 x 9	0.9848	0.8468	0.8473	0.9122	38.45
Sigma Lee 5 x 5	1.4721	0.9332	0.9634	1.4596	20.18
Sigma Lee 7 x 7	1.4646	0.9298	0.9300	1.4560	21.05
Sigma Lee 9 x 9	1.4601	0.9103	0.9106	1.4538	21.89

Figure 3: Qualitative analysis of filters



6. CONCLUSIONS

- Lee filter with a 9 x 9 window performed better for pre-fire image and Gamma 9 x 9 for the post-fire image.
- This is a short paper, so the evaluation will continue, but the results proved to be satisfactory for the objectives of this initial research.