We thank the reviewers for the time and effort they put in reviewing our manuscript. Based on their comments and advice, we have changed our methodology from an approach where the conversion of VOD to forest loss area was based on country-level statistics to a grid-cell level approach to estimate forest loss. This led to somewhat revised estimates and figures but overall our messages have not changed and the new approach allowed us to provide spatial estimates of errors. The spatial estimates resulted also in revised tables and figures.

The biggest changes are:

- *Revised figure with the data that are excluded*
- *Revised estimates of forest loss on a country-level.*
- *Revised estimates of VOD forest loss on a state-level.*
- *A new figure with a spatial error map, which provides uncertainties on a grid-scale.*
- *A new figure which shows the relation between the error of VOD compared to GFC with the mean forest loss.*
- *A new table with the Root Mean Square Error and Coefficient of Variance on a grid-scale and a country-scale for the different bins.*
- *A new table with the average gridded error between GFC and VOD per on a state-level*
- *The definition of net and gross forest loss and what GFC, VOD and PRODES exactly observe is described in more detail and used throughout the manuscript*
- *The introduction is extended with more information about other remote sensing techniques such as LiDAR and SAR deforestation products*
- *The conclusions include recommendations for future work with comparison to existing SAR and LiDAR based maps.*

We will start with showing the revised and new Figures and Tables and then address the reviewers point by point.

Kind regards,
Margreet van Marle, on behalf of all co-authors

Table 1a. Slope and correlation (r^2) of annual GFC forest losses ($km^2 yr^{-1}$) with IYD (yr^{-1}) for various VOD bins for all grid cells for the 2001-2010 overlapping time-period. In the fourth column the corresponding Coefficient of Variation (CV in %), which is based on the Root Mean Square Error (RMSE in km^2) between both datasets.

VOD bin	slope	r^2 (gridcell)	CV (%)	RMSE (km^2)
0.6-0.7	22.4	0.63	804	15.7
0.7-0.8	34.8	0.52	163	3.7
0.8-0.9	61.7	0.80	147	5.0
0.9-1.0	79.4	0.72	134	4.7
1.0-1.2	82.7	0.72	253	3.2

Table 1b. Country-level Pearson correlation coefficient (r^2) of annual GFC forest losses ($km^2 yr^{-1}$) with IYD (yr^{-1}) for various VOD bins for the overlapping time period. In the third column the corresponding Coefficient of Variation (CV in %), which is based on the Root Mean Square Error (RMSE in km^2) between both datasets.

VOD bin	r^2 (country)	CV (%)	RMSE (km^2)
0.6-0.7	0.63	203	666
0.7-0.8	0.84	122	586
0.8-0.9	0.84	83	567
0.9-1.0	0.88	92	684
1.0-1.2	0.96	53	366

Table 2. Country-level forest loss estimates (total area, contribution to total South American forest loss, as well as absolute and relative trends) for VOD and GFC for the overlapping time period (2001-2010). Asterisks indicate the significance, where $^{*}=p>0.25$ $^{**}=p<0.25$ $^{***}=p<0.05$

	Average forest loss 2001-2010						Slope 2001-2010			
	Absolute (km^2yr^{-1})		Percentage of total forest loss area (Absolute / Total)		Percentage of masked country [%]		Absolute (km^2yr^{-2})		Relative (Absolute/Average)	
	VOD	GFC	VOD	GFC	VOD	GFC	VOD	GFC	VOD	GFC
Argentina	4517	3329	11.73%	8.29%	0.61%	0.53%	79^{*}	358^{**}	1.68%	11.00%
Bolivia	3045	2338	8.07%	5.89%	0.39%	0.33%	21^{*}	166^{***}	0.75%	7.84%
Brazil	21926	27317	55.18%	67.81%	0.32%	0.39%	-1385^{**}	-1530^{**}	-6.47%	-5.55%
Chile	173	408	0.50%	1.04%	0.12%	0.30%	35^{**}	17^{***}	18.62%	4.19%
Colombia	1899	1861	4.95%	4.75%	0.20%	0.21%	-2^{*}	65^{**}	-0.13%	3.46%
Ecuador	450	305	1.24%	0.79%	0.18%	0.15%	-63^{**}	19^{**}	-14.19%	6.21%
Fr. Guiana	115	17	0.33%	0.04%	0.16%	0.02%	13^{**}	0^{*}	11.08%	1.18%
Guyana	288	50	0.75%	0.13%	0.16%	0.03%	-3^{*}	0^{*}	-1.24%	-0.61%
Peru	1077	1047	3.06%	2.69%	0.12%	0.13%	52^{*}	84^{***}	4.46%	8.24%
Paraguay	3030	2556	7.68%	6.49%	1.05%	0.98%	115^{*}	213^{***}	3.93%	8.78%
Surinam	276	29	0.75%	0.08%	0.25%	0.03%	34^{***}	2^{**}	12.57%	8.69%
Uruguay	868	122	2.28%	0.31%	0.77%	0.12%	131^{*}	18^{***}	13.61%	15.43%
Venezuela	1322	658	3.46%	1.70%	0.21%	0.11%	-148^{***}	20^{*}	-13.65%	3.12%
Total	38987	40038	100.00%	100.00%			-1121^{*}	-568^{*}	-2.94%	-1.42%

Table 3. Trends in forest losses based on VOD for the whole time period (1990-2010) and the decades 1990-2000 and 2000-2010. Absolute values indicate the slope based on Pearson linear regression and the relative values are the absolute values relative to the average forest loss for that country over the full 21-year time period. Asterisks indicate the significance, where *=p>0.25 **=p<0.25 ***=p<0.05

	Slope 1990-2010		Slope 1990-2000		Slope 2000-2010		Difference 00s-90s	
	km^2yr^{-2}	%	km^2yr^{-2}	%	km^2yr^{-2}	%	km^2yr^{-2}	%
Argentina	170***	4.58%	182**	6.47%	109*	2.37%	-73	-2.32%
Bolivia	49**	1.92%	92*	3.93%	72*	2.65%	-20	-0.16%
Brazil	-59*	-0.27%	1078*	4.85%	-765*	-3.65%	-1843	-16.74%
Chile	9**	5.23%	35***	21.39%	23**	12.11%	-12	-1.13%
Colombia	-36*	-1.88%	-197**	-9.98%	10*	0.58%	208	17.57%
Ecuador	-12*	-2.67%	-42**	-9.15%	-35*	-8.29%	6	2.27%
Fr. Guiana	0*	-0.31%	-8*	-6.13%	13***	11.60%	21	10.10%
Guyana	-8**	-2.72%	-16*	-4.98%	4*	1.58%	20	2.61%
Peru	-23*	-1.79%	-85*	-6.13%	45**	3.88%	130	6.94%
Paraguay	98**	3.99%	32*	1.76%	12*	0.39%	-21	-1.49%
Surinam	5*	2.25%	-21**	-10.38%	31***	12.09%	53	9.94%
Uruguay	60***	6.99%	130***	23.56%	-23*	-1.92%	-152	-13.99%
Venezuela	-50***	-3.97%	-57*	-3.91%	-80**	-7.79%	-23	-0.12%
Total	204*	0.55%	1122*	3.13%	-584*	-1.55%	-1706	-4.58%

Table 4. Average error on a state-level. The error is defined as the VOD minus GFC forest loss area as a percentage of GFC forest loss for the overlapping time period per State in the Legal Amazon.

State	*(VOD-GFC) / GFC (mean % yr^{-1})*
Acre	*17*
Amapá	*50*
Amazonas	*399*
Maranhâo	*17*
Mato Grosso	*35*
Pará	*94*
Rondônia	*37*
Roraima	*705*
Tocantins	*2*

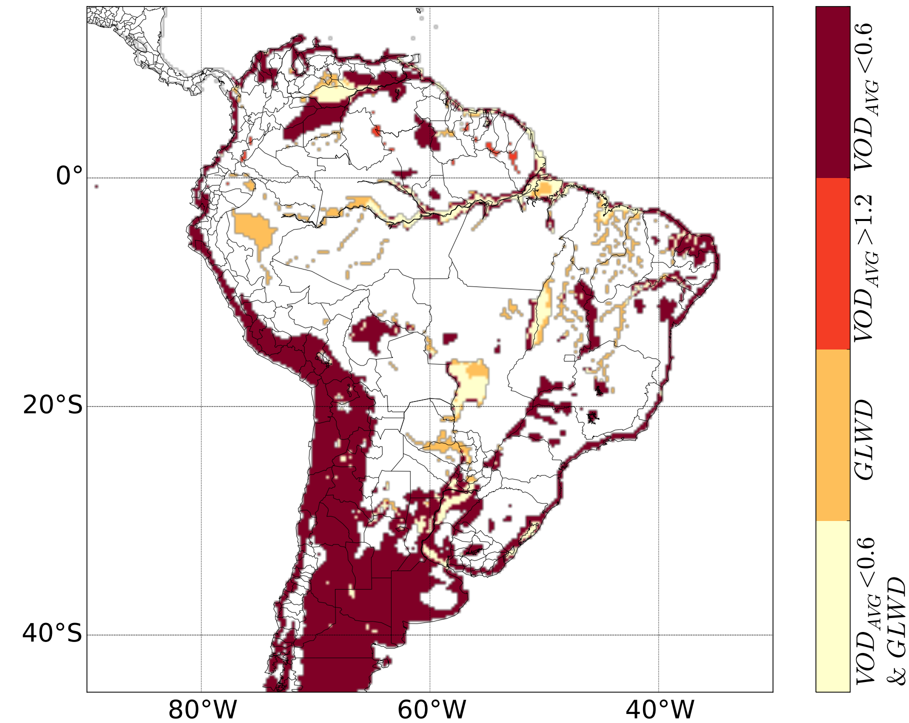

Figure 1. Grid cells that were excluded from our analysis: VOD avg: grid cells with an average VOD that is either above 1.2 or below 0.6 and thus outside the usable range for our study. GLWD: grid cells containing more than 50% open water, which leads to an unreliable VOD signal. Both: grid cells containing more than 50% open water and where VOD is outside the usable range.

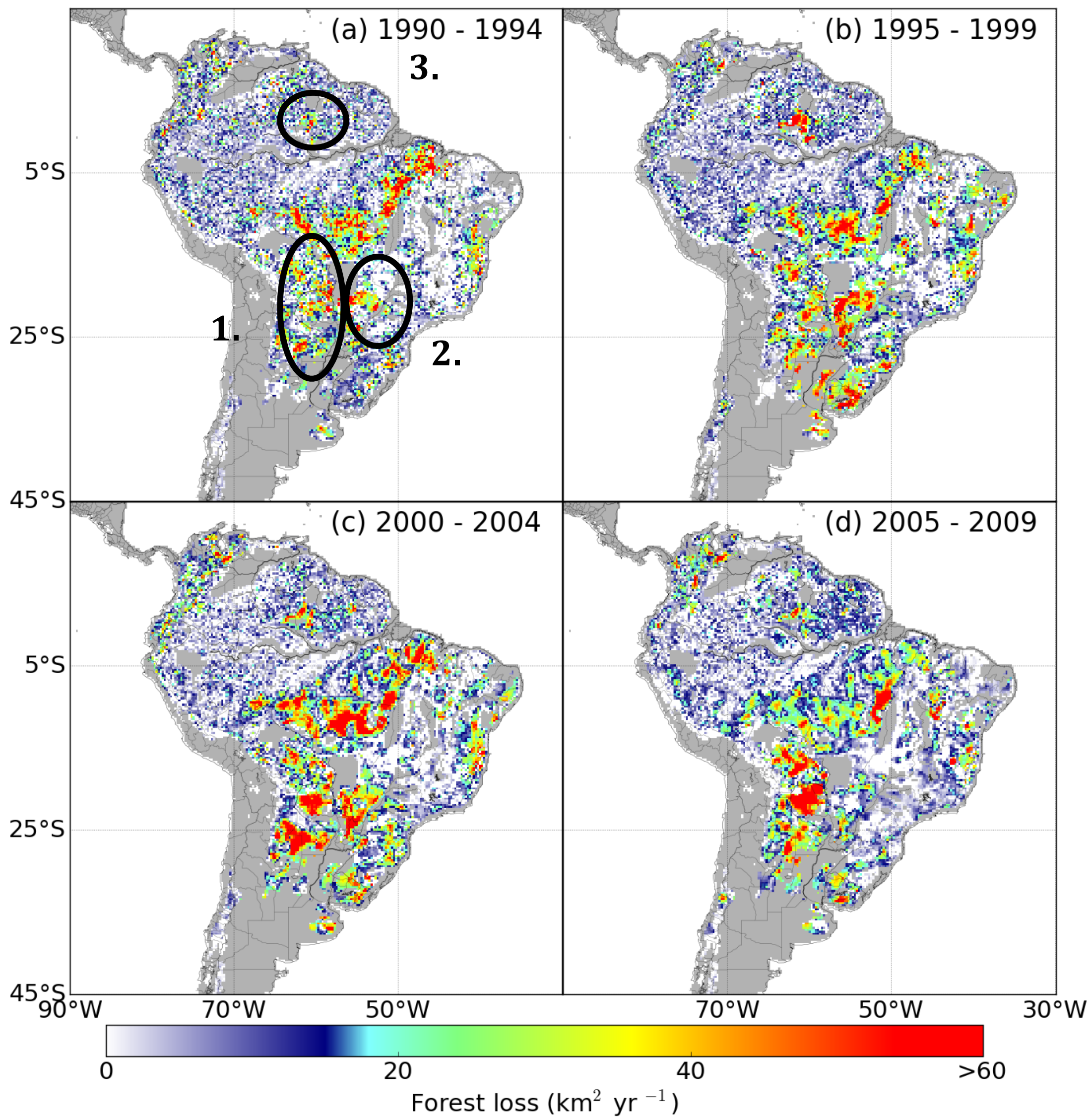

Figure 3. Forest loss extent based on the $VOD_{outliers}$ for 5-year epochs. Grey areas correspond to masked out grid cells.

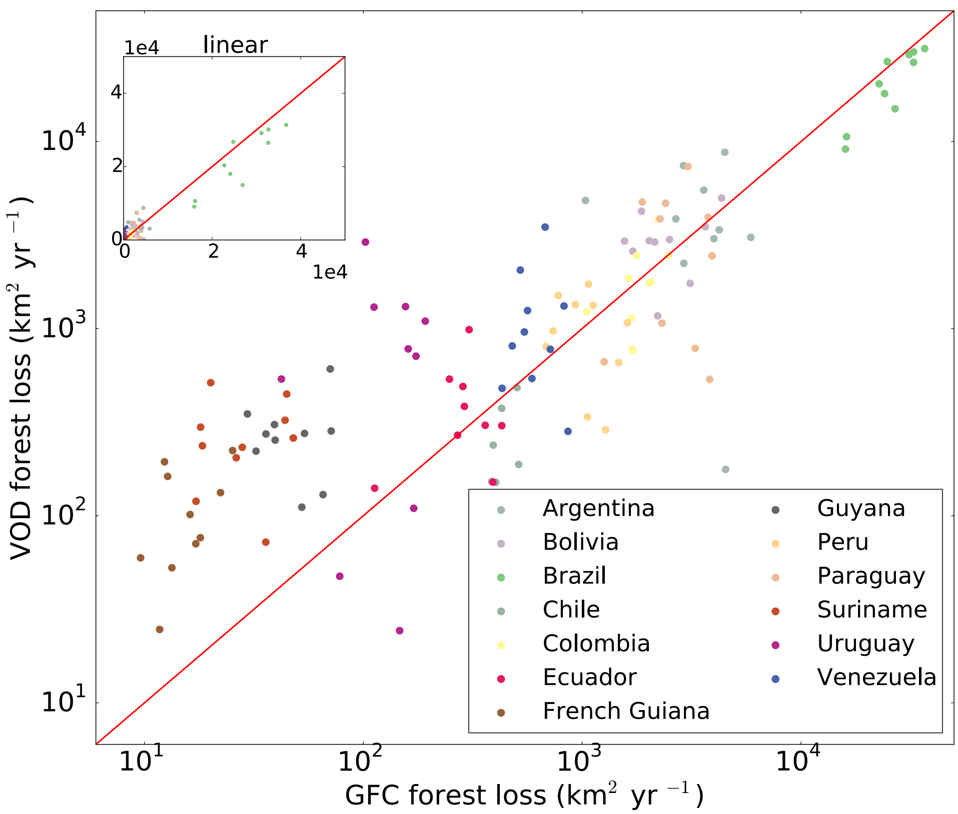

Figure 4. Country-level comparison of calibrated VOD and GFC forest losses based on annual totals (2001 - 2010). The inset shows the same data on a linear scale. The red lines depict the 1:1 line.

Figure 5. Country-level time series of annual totals of forest loss according to GFC (2001 - 2010) and VOD (1990 - 2010).

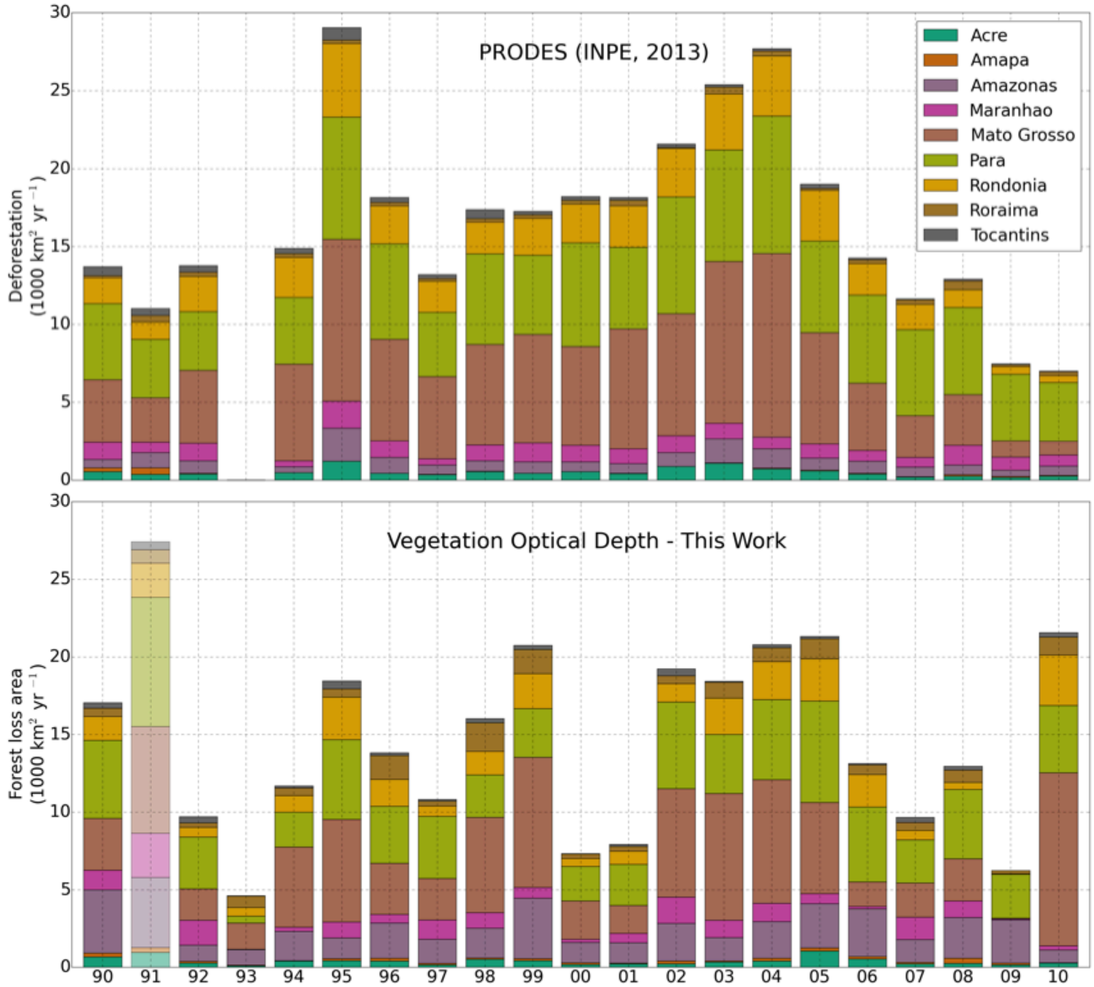

Figure 6. Time series of deforestation (a, PRODES) and forest loss area (b, VOD) for the Brazilian states in the Amazon (1990 – 2010). PRODES has no data for 1993 and the VOD values in 1991 are unreliable due to the volcanic eruption of Mt. Pinatubo.

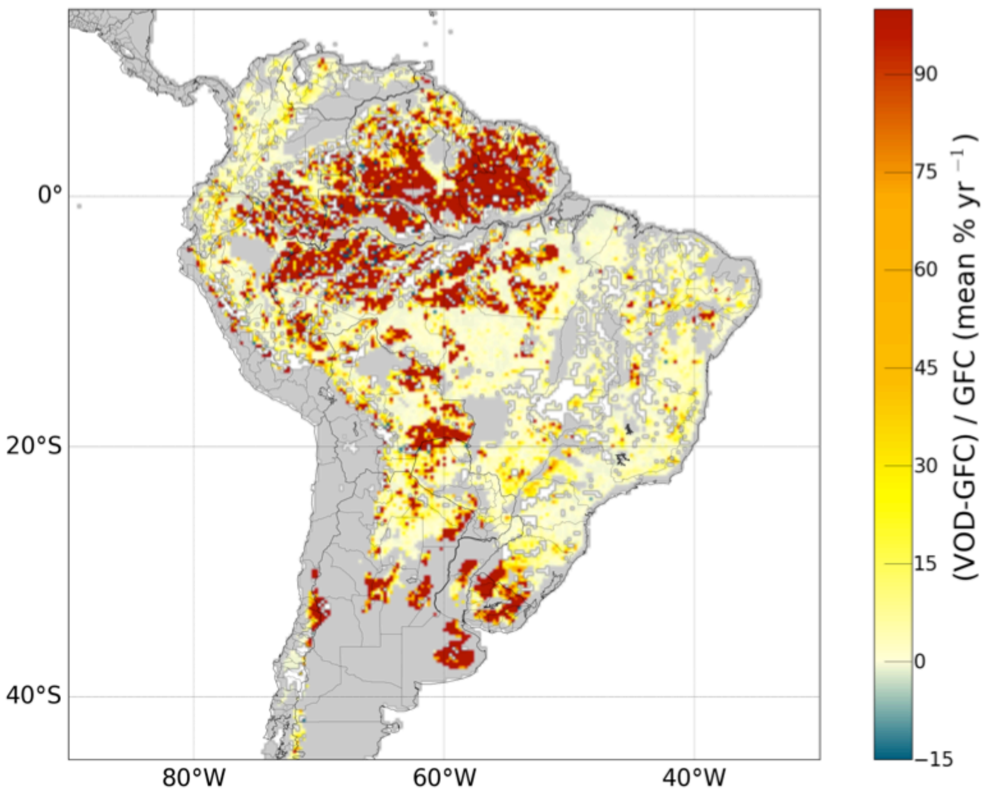

Figure 7: Error estimates for each grid cell. The error is defined as VOD minus GFC forest loss area as a percentage of GFC for the overlapping time period. White means no forest loss is observed in both datasets.

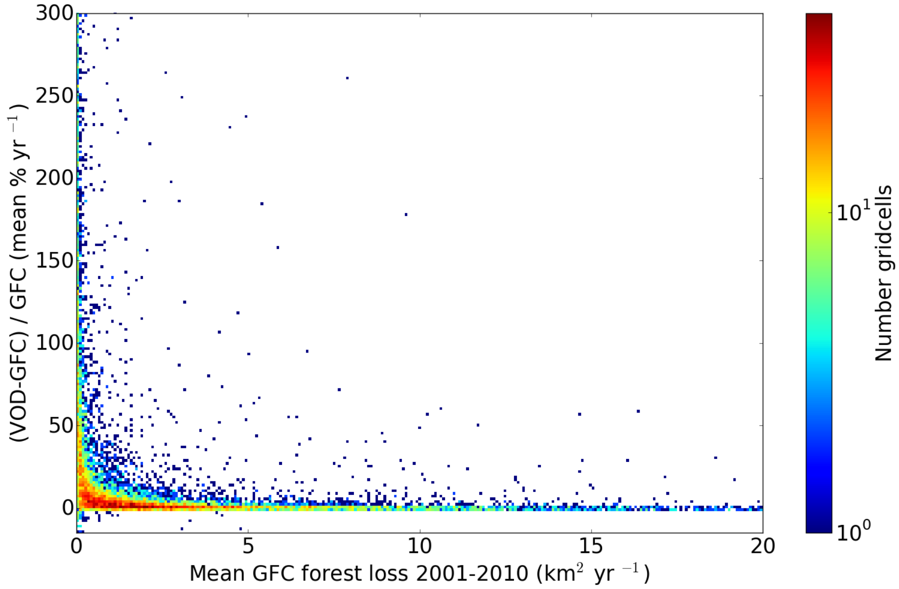

Figure 8. Error between GFC and VOD versus mean GFC forest loss, where the error is defined as VOD minus GFC forest loss area as a percentage of GFC for the overlapping time period.

General comments:
The method of estimating tropical forest loss on continental scale with passive microwave remote sensing data on continental scale is a new and interesting approach. The manuscript is well structured and well written. However, the authors should highlight what their new approach brings as new information with respect to existing datasets on forest loss, more specifically with respect to the Global Forest Change (GFC) dataset of Hansen et al. 2013, given that the VOD spatial resolution is much coarser than GFC's, and that a 'tuning' (calibration) of VOD data to GFC is performed (in order to produce forest loss area estimates from dimensionless VOD values). – In Abstract and Conclusions can be added. The authors must give an outlook on advantages and future potential use of this new method compared to existing methods. In general the authors should have put less emphasis on the detailed description of the forest loss area results per country but more on the reasons of the significant differences between the VOD-based forest loss area estimates and the corresponding PRODES and GFC estimates. In the conclusions the authors describe the three datasets (GFC, PRODES, VOD) as equally valid, each with their flaws and limitations. This view seems unfair (too positive) with regard to the VOD dataset which needs 'tuning' to another dataset (and is thus dependent on its quality), and, in addition, is missing a throughout analysis on its accuracy and on the factors that can influence the VOD signal (e.g. impact on "inter-annual scales by anomalous dry or wet conditions", volcanic eruptions, water bodies: : :).
Dear reviewer,

Major comments:
Tuning: The abstract should mention the comparison between the VOD-derived estimates and the PRODES data estimates and should clearly point out that the comparison with GFC estimates has limitations due to the interdependence of the two datasets (as the VOD-derived dataset was 'tuned' to GFC). This interdependence of the two datasets should also be pointed out more clearly in the sections where forest loss area estimates derived from of VOD and GFC are compared.
We changed page 11500, line15 to:
'Our results compare reasonably well with the newly developed Global Forest Change (GFC) maps based on Landsat data and available for the 2001 onwards period (r^2=0.90 when comparing annual country-level estimates), which allowed us to convert our results to forest loss area and compute these from 1990 onwards. We also compared these calibrated results to PRODES (r^2=0.60 when comparing annual state-level estimates).'

Early decade: The fact that after 'tuning' VOD data from 2000-2010 to GFC data the two datasets show substantial differences in forest loss area estimates (Table 2, Figure 5) is questioning the validity of VOD forest loss area estimates for the 1990-2000 period. VOD forest loss area estimates are provided for this earlier decade, but how accurate are they?

We agree with the reviewer that it is uncertain what the errors are over the 1990-2010 period, because no other datasets are available for such a long timeseries. Explanations for the differences are the different spatial resolutions of GFC and VOD and GFC measuring gross forest loss (deforestation and degradation), whereas VOD measures net forest loss (deforestation, degradation and net regrowth within a year). However, based on the comparable results over the overlapping time period in combination with the average error over South America (Figure 7), we feel the trends over the 1990-2000 period are relatively robust, although we don't know the exact forest loss for that time period, especially on annual time steps.

Moreover the comparison with PRODES estimates for the years 1990 to 2010 shows substantial differences in yearly forest loss area estimates over the Brazilian Amazon from the two datasets (VOD and PRODES).

VOD and PRODES do show large differences, but this may be partly due to limitations in both datasets. PRODES measures only deforestation of primary forest and VOD shows large interannual variability and is sensitive to open water bodies. However, many patterns between PRODES and VOD are comparable as indicated by the r^2 *of 0.60. Please keep in mind that for the overlapping period PRODES and GFC also deviate from each other, although they agree better with the Pearson* r^2 *of 0.92, see Figure X inserted below.*

Most importantly, VOD is the only dataset available for annual forest loss for all of South America currently, so despite the limitations we mention throughout the manuscript it yields information for time periods and regions were we currently have none.

We do agree with the reviewer that in future work a thorough analysis should be done to know what VOD is exactly measuring and how PRODES and VOD can be compared more directly. Therefore we added the following recommendation to the Conclusions section:

'This was a first approach towards a better forest loss product using VOD to better understand forest loss dynamics. The added value of our analysis is mostly providing new annual forest loss estimates during the 1990s, a period not covered by GFC, MODIS and other satellite datasets. Regarding future opportunities, more research is needed to know exactly what VOD represents, potentially comparing with existing LiDAR-based benchmark datasets datasets (Baccini et al., 2012; Saatchi et al., 2011).'

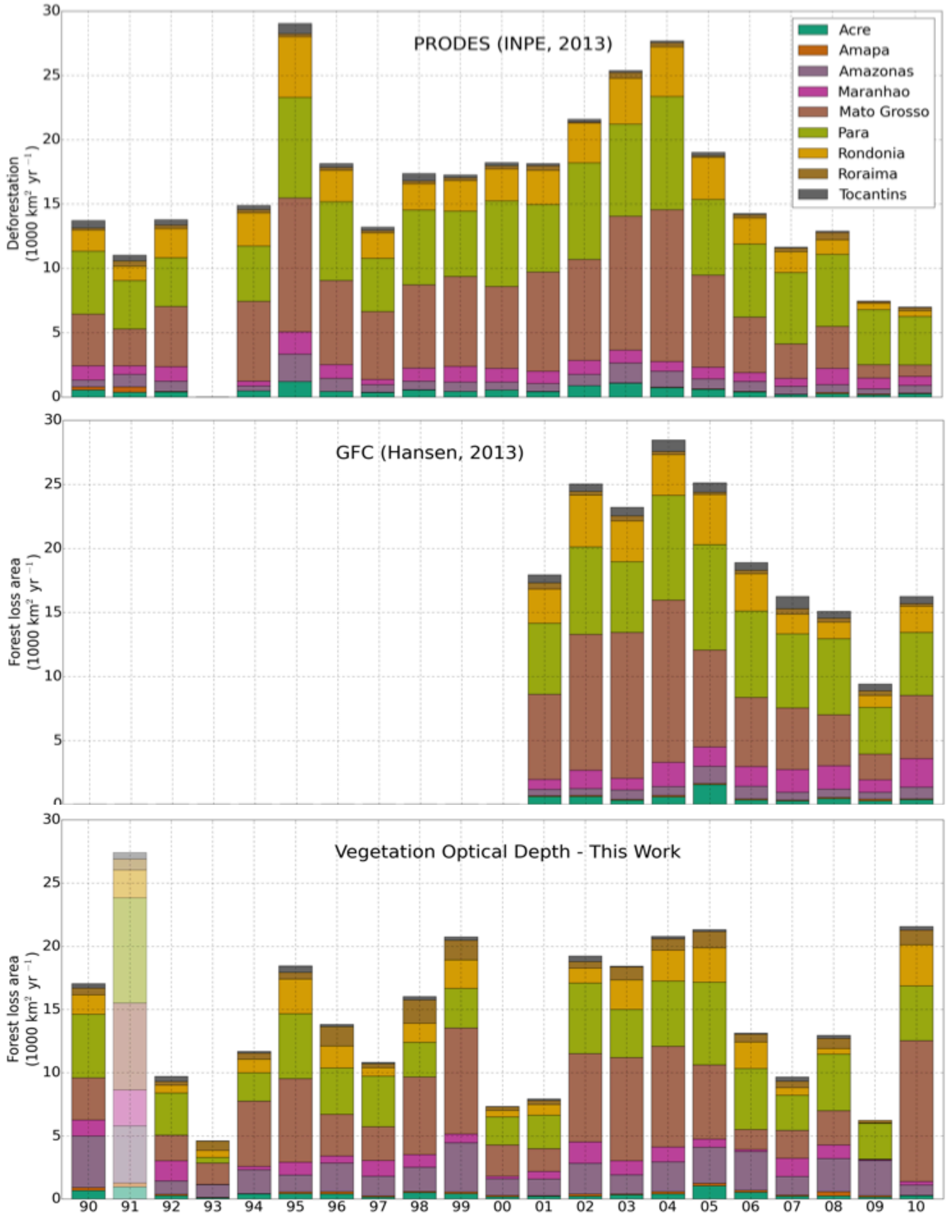

Figure X. Time series of PRODES deforestation (top), GFC forest loss (middle) and VOD (bottom) for the Brazilian states in the Amazon (1990 – 2010). PRODES has no data for 1993 and the VOD values are unreliable in 1991 due to the volcanic eruption of Mt. Pinatubo.

Spatial comparison with other datasets: In addition to the comparison of forest loss area estimates derived from VOD, GFC and PRODES (Figures 4, 5 and 6) the authors should also provide a spatial comparison with the GFC and PRODES datasets to show where the areas of forest loss coincide and where and how they differ. This can be very helpful in the discussion on the quality of the VOD-based forest loss data and on the factors that can influence VOD outlier values.
Accuracy: An independent assessment of the accuracy of the VOD-based forest loss area estimates is missing. Although such accuracy assessment can represent a large amount of work, it can be very useful to build confidence in such a dataset.
We appreciate this comment and have modified our approach to switch from country-scale to grid-scale analysis, please see the revised figures at the top of this document. We also added a new Figure 7, which depicts the spatial difference between VOD and GFC forest loss area estimates. The relative errors are large, but that is mostly on grid cells with dense vegetation and little change, see Figure 8. Because of this, we recommend throughout the paper that our approach is most suitable for regional estimates.

Furthermore we calculated the RMSE for both the grid-scale and country-scale analysis and these results are shown in the revised Table 1a (grid-scale) and Table 1b (country-scale). The main result is that the bin with the lowest average VOD values (0.6-0.7) has the highest error in the comparison with GFC.

An independent assessment is difficult, because no other dataset exists with continuous data over the whole time period for such a large region. We think PRODES is the dataset that comes closest and provides valuable estimates. However, PRODES and VOD do not measure the same, so a spatial comparison with this dataset does in our opinion not add so much to the already existing Figure 6. We did calculate the Root Mean Square Error with PRODES on a state-level.

Therefore we changed Page 11513 Line 28 to:
'We do not expect PRODES and our dataset to compare perfectly given that PRODES detects only deforestation of primary forests and VOD detects both deforestation and degradation including forest loss of secondary forest. Nevertheless, the Pearson's r^2 over the full 21-year time period between these two datasets was 0.60 ($p<0.001$) (Table 3) with a RMSE of 1.6E3 km^2yr^{-1} (CV= 84% relative to mean PRODES) on a state-level.'

PRODES comparison: The comparison with the PRODES forest loss dataset is definitely an independent one, but is not discussed in depth and rather regarded as of minor significance ("apples and oranges"), because of the "differences in methodology and spatial resolution: : : but also potential inconsistencies: : :". For the Brazilian Legal Amazon region, the PRODES dataset is one of the most relevant existing datasets, and should be fully taken into consideration. While certainly some technical issues need to be taken into account for such comparison (minimum mapping unit, cloud compensation, the exclusion of forest regrowth from the forest cover), a more in-depth comparison should be carried out and could be used as partial accuracy assessment over this region.

We agree with the reviewer that PRODES is a dataset with significant value for the scientific community, but this dataset does not provide the same information as VOD. VOD measures the change in net forest loss (the net result of deforestation, degradation and regrowth within a year), whereas PRODES measures deforestation only once in primary forest. Furthermore VOD is based on consistent daily observations and PRODES measures deforestation once per year.

We do agree we could discuss this more including the new insights from error estimates from Figure 7 and the new Table 4 containing average errors per state based on Figure 7.

We replaced Page 11514 Line 5 to:

'While there are substantial differences in the temporal variability in the VOD and PRODES datasets, they do agree on where most forest losses occurred: Pará and Mato Grosso. Combined, these two states were responsible for 69% and 61%, for PRODES and VOD respectively, of all Brazilian Legal Amazon deforestation (PRODES) and forest loss (VOD). Furthermore PRODES and VOD partly agree on interannual variation (r^2=0.60), although the magnitude between both datasets is different.'

Added to Section 4.4 Page 11514 Line 12:

'The states with largest relative differences between VOD forest loss and PRODES deforestation are Amazonas and Roraima, with 1307 km^2yr^{-1} and 499 km^2yr^{-1} respectively. These regions have little forest loss. The gridded errors for these states for VOD compared with GFC for the overlapping time period are relatively large: 705% and 399 % for Amazonas and Roraima respectively (Table 4, Figure 7).

Added to Discussion at Page 11517, Line 22:

'On a state-level VOD overestimates forest loss area in the states of Amazonas and Roraima, which is mostly related to the relatively low and small-scale forest losses in these states (Table 4, Figure 7).'

Difference in forest loss area estimates between PRODES and GFC: Part of the considerable differences of forest loss area estimates between PRODES and GFC for the year 2010 can be explained, as the authors state, by the limitation of the PRODES method which does not take into account re-clearing or forest regrowth. However, when comparing yearly estimates of gross forest loss from the two datasets, a relatively stable offset appears between the two datasets (systematic higher values in GFC data), thus leaving the GFC peak for 2010 unexplained.
We agree with the reviewer that in most of the years there is a relative stable offset between GFC and PRODES (Fanin and van der Werf, 2015, Figure 3a). However, the years 2010 (and in their research also 2012) show an increase in forest loss in GFC. Those years were years with elevated fire activity in secondary forests, thus masked out and not registered by PRODES.

Usage of monthly VOD values: The authors mention that one of the advantages of the VOD is the possibility to use monthly data. However, these monthly datasets (calculated through a 19-month moving average) are used to produce the "Interyearly Difference (IYD)", of which the negative IYD values only are used for further analysis by calculating yearly and 5-year accumulation of IYD values. The monthly VOD signal as such is not used directly for analysis but only indirectly to produce yearly IYDs, and no conclusions are based directly on the monthly values. In this respect, the monthly VOD values are not used in a very different way compared to the bi-monthly image acquisitions of Landsat 7, which are mosaicked and analysed in order to produce the GFC yearly forest loss area dataset. The potential of producing monthly VOD estimates should be described and further discussed.
The reason why we used the 19-month moving average is to filter for seasonal variations in the signal. With using this averaged signal the interannual variability in the start of the dry season is minimalized and therefore we hope to prevent false detections during the dry season. We agree that GFC based on Landsat 7 is for now the best dataset available for forest loss and it does produce bi monthly data, but is only available from 1999 onwards, whereas earlier Landsat images do not provide clear images on such a high temporal resolution.
To clarify this we changed Page 11517 Line 6 to:
'While we would in general favor GFC over VOD during the overlapping periods for reasons mentioned above, the temporal resolution of VOD is superior to any other dataset for our study period from 1990-2010. For areas with frequent cloud cover where Landsat may have difficulties in acquiring reliable data, VOD may be in a better position to map forest loss over the 90s.'

Forest Plantations: The authors do not mention the issue of forest plantation harvesting which has a high impact on the VOD values. In many areas (e.g. Southern and Central Brazil, Uruguay) forest cover changes in forest plantations are the main sources of (temporary) forest cover loss. The high forest losses e.g. in the Amazon (land use change) has different implications compared to the high forest losses in e.g. Southern Brazil (mainly land cover change). This should be pointed out in the manuscript.

We agree and changed page 11517, Line 4 to:

'In Uruguay many forest plantations occur (Suppl. Figure 1, Achard et al., 2014) and the result of these plantations is that forest losses are often of small scale. This in combination with the overestimation of VOD with smaller scale forest losses, could explain why Uruguay shows so much higher values on a country scale, although additional research is required to better understand these differences.'

False VOD-based forest loss: The manuscript discusses in detail the forest losses in the Amazon rainforest and the Chaco forest, where the VOD approach seems to work reasonably well. However, the discussion addresses only shortly the issue that for countries like Chile, Uruguay, and Surinam the VOD approach provides very different estimates compared to GFC (the paper mentions only the different spatial resolutions of the two datasets as the probable main reason). This discussion is essential and should be held in more depth. In fact, the VOD results show relatively high forest loss values in areas where the forest cover is very small (e.g. Uruguay). This issue of overestimation of forest loss arises also within Brazil outside the Amazon and Chaco regions: e.g. high forest loss is estimated for Southern Brazil (Rio Grande do Sul, Santa Catarina and Parana States) for the period of 2000-2004 (with 5-year VOD outlier values comparable to those within the arc of deforestation) which does not seem to correspond to reality. Another example would be Southern Bahia (South of Salvador) where, according to VOD data, high forest loss occurs throughout the 20 year period – while not much evidence is found for this loss in the satellite imagery. –

We agree with the reviewer and we hope to cover this point by doing the grid cell analysis including error estimates described in the new Figures 7 and 8. We tried to correct for this by taking different VOD classes (e.g. 0.6-0.7,0.7-0.8, etc.) as a measure for tree cover percentage per grid cell. This however, will not correct for size of the forest loss.

Country level statistics: Under point 4.2 (Calibration with GFC) the authors describe the 'tuning' of the VOD outliers to the GFC forest losses and state for some years considerable differences in forest loss estimates. A throughout discussion on these differences is missing, as well as information (as mentioned before) on their spatial distribution (apart from country-specific information).

We hope to have answered this comment by performing the per-grid cell analysis and spatial error estimation, see Figures 7 and 8.

Technical corrections:
Section 11500, Line 24 (Abstract): “One of the key findings” mentioned in the abstract is the decrease of forest loss in Brazil after year 2005, but this decrease has already been reported by many sources, e.g. by FAO in the FRA 2010 report. The sentence should thus be changed in “the analysis of VOD-based forest loss estimates are in agreement with other studies that state : : :”, or similar.
We changed this in the Discussion and refer to the FRA 2010 report:
‘Our results agree with earlier work showing that forest loss area, and probably also carbon emissions, declined after peaking in the year 2004 (Food and Agriculture Organization of the United Nations, 2010; Macedo et al., 2012; Malhi et al., 2008; Nepstad et al., 2009).’

Section 11501, Line 27: Starting in 1972, Landsat MSS had a spatial resolution of 80 m (but was often resampled to 60 m), this should be added to the mentioned resolution of Landsat (E)TM spatial resolution of 30m
We changed this to: “Landsat satellite imagery is the longest operative option for monitoring vegetation. Starting in 1972, through January 1999, the Landsat Multispectral Scanner (MSS) has continuous data on relatively high spatial resolution of 90 meter. From 1972 the Landsat (Enhanced) Thematic Mapper ((E)TM) provides vegetation cover from 1982 onwards on a an even higher spatial resolution of 30 meter, with a 16 day revisit time.”

Section 11502, Line 8: “coarser” spatial resolution instead of “courser: : :”
We changed this.

Section 11502, Line 12 ff.: Achard et al. 2014 (global), Eva et al. 2012 (regional, for tropical South and Central America) and Verhegghen et al. 2012 (regional approach with MERIS and SPOT VGT data) should be added to the list of publications mentioned here. The reference “Céline et al. 2013” should be “Ernst et al. 2013”, the first name and last name of the author was reversed – which is the case for all other names in this reference (Section 11519). –
We changed this to:
‘Over the past years, the number of datasets quantifying vegetation dynamics, carbon stocks and other relevant vegetation quantities on both global and regional scale has increased substantially, often using Landsat data but also other data sources including datasets based on Moderate-resolution Imaging Spectroradiometer (MODIS, launched in 1999 on board of Terra and in 2002 on Aqua), Medium Resolution Imaging Spectrometer (MERIS, 2002-2012) and Satellite Pour l’Observation de la Terre Vegetation Program (SPOT VGT, from 1986 onboard different satellites) (Achard et al., 2014; Baccini et al., 2012; Broich et al., 2011; Ernst et al., 2013; Eva et al., 2012; Frolking et al., 2012; Jones et al., 2011; de Jong et al., 2013; Kim et al., 2015; Koh et al., 2011; Mayaux et al., 1998; Morton et al., 2005; Potapov et al., 2012; Saatchi et al., 2011; Verbesselt et al., 2012; Verhegghen et al., 2012; Wasige et al., 2012).’

Section 11502, Line 17 (and Section 11506, Line 2): INPE is not the Brazilian Space Agency, but the Brazilian National Institute for Space Research
Section 11502, Line 18: the project called PRODES is not called the "Monitoring the Gross Deforestation in the Amazon Project", but "Program for Deforestation Assessment in the Brazilian Legal Amazon with Satellite Imagery"
We changed this to: 'One of the regions most closely monitored is the Brazilian Legal Amazon, where the Brazilian National Institute for Space Research (INPE) developed the Program for Deforestation Assessment in the Brazilian Legal Amazon with Satellite Imagery (PRODES) yielding annual deforestation estimates since 1988 based on a multi-data approach from Landsat data with the China-Brazil Earth Resource Satellite (CBERS-2B) and UK-DCM2 from the Disaster Monitoring Constellation International Imaging (DMCii) (Shimabukuro et al., 1998).'

Section 11503, Line 27: ": : :to Landsat-derived datasets including: : :" should be ": : :to the Landsat-derived datasets of PRODES: : :"
We changed this to: 'We detail how we translated the VOD signal to forest loss by calibrating this dataset to the Global Forest Change maps of Hansen et al. (2013) and comparing these results to the Landsat-derived PRODES-dataset.'

Section 11505, Line 20: "with" or "at" instead of "on a 30 m resolution, the 30 m can then be dropped in the next sentence
We changed this to: '...at a 30-meter resolution.'

Section 11506, Line 10: "Landsat 5/TM" should be "Landsat 5 and Landsat 7"
We changed this.

Section 11506, Line 14: "shadefractioned images" should be "images of soil, shade and vegetation fractions"
We changed this to: 'After 2002, PRODES started to use digital image processing and visual interpretation of Landsat bands 3, 4 and 5 creating and interpreting images of soil, shade and vegetation fractions (INPE, 2013; Shimabukuro et al., 1998).'

Section 11506, Line 16: the method described does not yield 'gross forest loss', it yields 'net forest loss', for areas where the forest loss exceeds forest gain (as only negative VOD outliers were considered) –
We change Page 11509, Line 16 to:
'In general, our method yields net forest loss per gridcell within one year, because we considered decreases in VOD, which is the net result of deforestation, forest degradation and regrowth within a gridcell per year.'

Section 11510, Line 5 ff.: In Figure 3 the arc of deforestation is not a 'dominant' feature, it is rather a well-known feature which is thus recognized easily, but in all four parts of the figure it is one among various areas which show high absolute "Summed IYD values (-)".

We changed this to: 'The largest feature over our study period is the well-known arc of deforestation along the Southern edge of the Amazon basin (Fig. 3), showing high forest loss in every period.'

The interpretation of figure 3 is too short and too fuzzy with respect to the importance of the figure that shows the main results (summed IYD values (-) indicating forest loss) in their spatial distribution.
We included a spatial error analysis on a gridcell-scale and added the following text to Section 4.1:
'The largest errors are found in the regions with dense vegetation and relatively little forest loss (Figure 7, Figure 8). The RMSE on a grid-cell scale shows that the bin with the lowest average VOD values (0.6-0.7) has the highest error compared to GFC (Table 1a).'

Section 11511, Line 5: Equation (4) is either missing or not numbered correctly. *We changed this to: 'We converted the summed $VOD_{outliers}$ to a forest loss area according to Eq. 3, where the slopes varied between the 5 different bins (Table 1).'*

Section 11516, Line 12: 'strict regulations' is an imprecise term, it should be "strict forest law and effective forest law enforcement" or similar.
We changed this to: 'One explanation could be relocation of agricultural hotspots because of the strict forest law and effective forest law enforcement within Brazil (Dobrovolski and Rattis, 2014).'

Section 11518, Line 7: ": : : partly because it was related to secondary forest degradation" should be ": : :partly because of the deforestation of secondary forest" or similar. –
PRODES does not capture changes in degradation nor deforestation of secondary forest. Therefore we changed this sentence to:
'PRODES did not show this peak, partly because it was related to secondary forest degradation and deforestation'.

Section 11532, Figure 3: The caption of the figure is not correct, as the figure does not show forest loss extend, but the "Summed IYD values (-)".
In the new and revised figures, this one is replaced with one with forest loss area.

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