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Interactive comment on "Spatial variations and development of land use regression models of levoglucosan in four European study areas" *by* A. Jedynska et al.

Anonymous Referee #3

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Review on: Spatial variations and development of land use regression models of levoglucosan in four European study areas - by Jedynska et al.

The paper aims to determine the spatial contrast of levoglucosan within and between four European study areas – Oslo, the Netherlands, Munich/Augsburg, Catalonia -, to correlate levoglucosan and other molecular markers analyzed within the ESCAPE and TRANSPHORM projects, to assess the wood smoke contribution to OC, seasonally as well as annually, and finally, to develop and evaluate Land Use Regression (LUR) models for levoglucosan.

Specific Comments:

The first two goals were more or less attained for the measurement periods. The authors found fair correlations between levoglucosan and ΣPAH and benzo[a]pyrene, all three linked to biomass burning primary aerosol. The poor correlations levoglucosan/ K+ in PM2.5 as well as in PM10 require explanation. Are there other sources playing a role? As expected, there was no correlation to primary and secondary traffic emissions.

The last two objectives couldn't be achieved due to the very limited dataset of levoglucosan measurements.

- Page13501Lines9-11: 'Our correction procedure followed the modified ESCAPE procedure used for EC/OC, PAH and hopanes/steranes (Eeftens et al., 2012b; Cyrys et al., 2012).' To be noted, these studies present average concentrations of NOx, NO2, PM2.5, and PM10 for each investigated site, using an adjustment for temporal variation from data measured continuously at a background site. But, at that site, levoglucosan was not analysed during the periods relevant for the study (Page13501Lines13-14: 'Levoglucosan and EC/OC, PAH and hopanes/steranes were not analyzed at the reference sites because of lack of sampling equipment.'). Therefore, the method can't be applied here.

The solution found by the authors is explained in Page13501Lines14-20: 'To adjust for temporal variation, we identified which component measured at the reference site correlated best temporally with levoglucosan. First, the temporal correlation was calculated for each site between levoglucosan and the standard pollutants based upon three samples... As we had only three samples per site available...' At least at three study areas, the component employed for temporal correction is a very specific marker of traffic emissions, NOx (Table2 in the supplement), while levoglucosan can arise only from biomass combustion. The used approach is questionable.

Consequently, a seasonal and annual wood smoke contribution to OC seems to be at

least ambitious.

The description of developing land use regression models is poorly described in this study. The understanding of the approach is eventually hindered by the fact that the authors use for development of LUR for levoglucosan spatial covariates which mainly relate to road traffic.

Generally, the authors might consider that development of LUR for levoglucosan makes no sense in regions like Catalonia, where significant exposure to smoke is during forest fire episodes. These events are not enclosed in the data set presented in this study. At best, they might appear as 'outliners'. More suitable for this goal are regions with woodstove use, as shown in three studies cited by the authors.

- Page13495Lines13-14: 'Because of its stability and concentration in the fine fraction, levoglucosan concentrations may be affected by regional sources.' Levoglucosan was shown to be not stable in the atmosphere, but significantly oxidized by OH radicals (Hennigan et al. GRL, 2010 and references therein). This might have a strong impact on levoglucosan concentration distribution, especially in Catalonia region (Reche et al. SciTotalEnviron, 2012).

Overall, the paper doesn't achieve its innovating objectives. It lacks in description of the used methods and it is confusing in the result interpretation.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 13491, 2014.