This manuscript presents temporal variations of the descriptive hygroscopic growth factors (DGF) obtained in the city center of Paris from January to February 2010. The obtained results were compared with theoretically calculated growth factors using ZSR rule and in-situ data analysis of aerosol particle composition. The topic of the manuscript is relevant to the journal. I think that further clarification would be required prior to publication in ACP.

General comments

My main concern is in the verification of the summation method (SM), which was used to extract the size-resolved growth factor. In this manuscript and in previous papers (Eichler et al., Atm.Environ, 2008; Achtert et al., J. Geoph. Res., 2009 and Birmili et al., Boreal Environ.Res., 2009) the authors state that DGF is representative of the metrics of atmospheric particle hygroscopic growth, but no experimental confirmations have been submitted. For the beginning I would suggest to compare HDMPS/TDMPD results with regular size-selected HTDMA measurements for different field conditions. It will then be possible to quantify the potential errors of the method used, and therefore more convincingly explain correlations between the aerosol particles hygroscopicity and their chemical composition.

Specific comments

p.14299, line 23, Introduction
Despite recent improvements in understanding the water uptake characteristics of organic-containing particles, in situ measurements are sparse.

I can't agree with this statement. See, for example, size-resolved hygroscopic measurements recently published by Kammerman at al.(ACP, 10, 10717, 2010); Ye et al.(Atmos. Environ., 99, 353, 2011), Fors et al. (ACP,11,8343,2011); Jurányi et al.(ACP, 13, 6431, 2013) and Laborde et al.(ACP, 13, 5831, 2013). These articles should be discussed in the context of this work especially the last two papers, which present the size-resolved HTDMA results obtained in Paris within the same time frame as the MEGAPOLI European project.

p.14299, line 26 *The standard method for calculating hygroscopic growth from the aerosol chemical composition is based on volume-weighted water uptake by the individual chemical constituents, the so-called Zdanovskii–Stokes–Robinson mixing rule.*

The ZSR rule is based on the water mass additivity (not volume). To convert this rule into a volume scale the volume additivity assumption is additionally used. This sentence should be reworded.

p.14302, line 10 ***2.3.2 The humidifying differential mobility particle sizer***
p.14304, line 9 ***3.1 Determination of hygroscopic growth factors***

These sections are actually complete copies of the corresponding sections in the already published papers (Eichler et al., Atm.Environ, 2008; Achtert et al., J. Geoph. Res.,2009 and Birmili et al., Boreal Environ.Res.,2009). There is no sense to repeat them again. Authors need only focus on the changes that have undergone measurement technique and data processing compare with earlier studies.

p.14305 line 26 *"However, as long as no stepwise changes with particle size are observed in the average hygroscopic growth factors, the SM remains valid".*

As noted previously this statement must be quantitatively supported. It is necessary to indicate the uncertainty of the summation method using either independent size-resolved HTDMA data or (at worst) numerical experiments with aerosol models that are typical for urban and regional conditions.

p.14310, line 28, *".... (Fig. 5a) with a volume fraction of 48 %",*
while Figure 5a shows the value of 49% .

p.14311, line 3 and Fig.5. RH?
Please specify the RH used both in the text and in the figure caption.

p. 14312, line- p.14312, line 8.

The explanation of the discrepancy between the measured and calculated growth factors due to nitrates do not look convincing. In winter time from 16 to 20 and from 21 to 24 January the measured DGF are relatively well reproduced by the calculated GF, and the data presented in Fig.1b clearly show that nitrates do not fluctuate less than on other dates.
Additionally, expressions like "..strong diurnal variation.."(p.14310, line 15).., "..strongest variation in this time interval.."(p.14312, line17), "..the DGF shows a much higher variability in winter than in summer," (14313, line 2) etc., should be accompanied by respective statistical estimates. The graphic information presented in Fig.1 and Fig.6 does not permit estimating the validity of the proposed relationship between nitrate mass and aerosol particle hygroscopicity.
In the context of this problem, I believe that a more profound study of the uncertainties caused by the experimental method used and model ZSR calculations needs to be included before the results presented in Section 4.5 can be compared.

p.14326, Fig.2.
In Fig.2b the correlation coefficient has a negative value (- 0.52).
The R, the fit line and fit equations should be disclosed in the figure caption.

p.14330, Fig.6.
All symbols in Figs. 2b and 2c must be explained in the figure caption.
What is meant by corr.low NO_3 =0.76? In Fig.2b, d the correlation coefficient was denoted as "R."
Do red and blue points refer only to Fig.6b?

Technical comments
p.14311, line 18. …***saltis*** *reduced*