1. We propose to add some more words on the benefits of the bottom-up approach in the discussion. "The study showed that the bottom-up approach leads to realistic water demand patterns and travel times, without the need for any flow measurements or calibration. In the periphery of the DWDS it is not possible to calibrate models on pressure, because head losses are too low. The study shows that in the periphery it is also difficult to calibrate on water quality (e.g. with tracer measurements), as a consequence of the high variability between days. The stochastic approach of hydraulic modelling gives insight into the variability of travel times as an added feature beyond the conventional way of modelling. The conventional $Model_{TD}$ has a higher auto and cross correlation of flows than the actual flows in the network. This results in the $Model_{TD}$ underestimating the flow direction reversals, stagnant flows and thus maximum travel times. Because Machell et al. (2009) have argued that the maximum travel time is much more important than the average travel time, the $Model_{BU}$ has benefits in determining water age."

2. There are no tanks in the network; we will add this information to section 2.1.

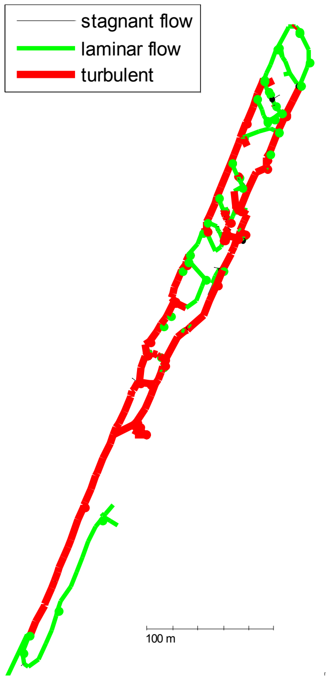
3. It is true that SIMDEUM does not require flow measurements or calibration measurements. For now, SIMDEUM does only provide residential demand patterns. Therefore, for hotel and beach clubs a different approach of demand allocation was used. We will elaborate; see also reply to reviewer # 1.

4. The 3 + 20 hours is correct, thus shifting the pulse by one hour every day. We will elaborate; see also reply to reviewer # 1.

5. We will elaborate on Reynolds number; see also reply to reviewer # 1. From figure 7, the EC at location 4 seems higher than at location 1 and 2. However, the pulse at location 4 should be compared to the pulses at location 1 and 2 of a day earlier. These pulses are not shown in the paper, but they had slightly higher values and therefore the EC at location 4 is not higher (but slightly lower) than the EC at locations 1 and 2.

6. We propose to add some more words on the dispersion in the discussion: "As 30% of the pipes experience laminar flow for more than 50% of the time, dispersion is an issue in this network. Especially at location 4, the NaCl pulse will show dispersion with mainly laminar flow during the last 24 hours of the flow. As the water age was derived from the NaCl pulse, the measured water age includes dispersion. When the measured water age is compared to model results, the model should also incorporate dispersion. It would be interesting to validate an advection-dispersion-reaction model (Li et al. 2006; Tzatchkov et al. 2002) in this network."

- 85% of the pipes (>= 55 mm) have no stagnant flow during the day; 2% of the pipes experience stagnant flow for more than 50% of the time.
- 3% of the pipes have no laminar flow during the day; 30% of the pipes experience laminar flow for more than 50% of the time.
- 20% of the pipes have no turbulent flow during the day; 43% of the pipes experience turbulent flow for more than 50% of the time.



The figure shows the pipes with mainly turbulent flows and mainly laminar flows during the day.

7. A few measurement days showed shorter travel times at locations 1-3 at 18:00 hour and later, compared to the rest of the measurements. There is nothing special about these days (around 14 September); they are both weekdays and weekends, they don't show particular high or low demands nor do they have specific demand patterns. The measurements do fall within the expected confidence interval, which is also wider in the evening compared to the rest of the day (especially noticeable at locations 1 and 2).

8. Within the limits on NaCl and electric conductivity of the Drinking Water Act and the practical boundaries of NaCl dosage and EC measurements a rise of 10 mS/m was determined as best practice. An earlier test is a smaller network showed that by adding a NaCl solution before a booster pump ensured full mixing (no buoyancy) and a pulse that could be discerned easily.

- typos will be corrected.

Pg 6, Ln 23: The common ModelTD uses a time step of 15 minutes, based on the normally available measurements of a 15 minute time interval. Also, a shorter time step would lead to less smooth demand patterns (smaller auto correlation) which is unwanted in a top-down approach. For the ModelBU a highly variable demand pattern can occur. Therefore, a shorter time step was used (5 minutes). In (Blokker et al. 2008), we have shown that with a time step of 5 minutes the Reynolds number is most often predicted well compared to a time step of 1 minute or less, but a time step of 15 minutes leads to deviations. We will add some words on this.

Pg 10, Ln 4-8: The variability of the ModelTD is not shown in the Figure 8. For reasons of readability it will not be shown. The text will be altered.

Pg 9, Ln 7 & Pg 10, Ln 10: The question on how much the models' predicted water age may differ from the measured values is still unanswered. Both models predict the water age reasonably well (ME < 30% and RMSE < 30%), but the ModelBU has smaller ME and RMSE than the ModelTD. We will rephrase the indicated lines.

Pg 10, Ln 16: typo will be corrected

Figure 1: We will adjust; see also reply to reviewer #1.

Figure 3: We will adjust; see also reply to reviewer #1. We will delete the measurement location 2 line.

Figure 4: We will add average demands in the caption.

Figure 5 & 6: We will add demand model in the caption

References:

Blokker, E. J. M., Vreeburg, J. H. G., Buchberger, S. G., and van Dijk, J. C. (2008). "Importance of demand modelling in network water quality models: a review." *Drink. Water Eng. Sci.*, 1(1), 27-38.

Li, Z., Buchberger, S. G., and Tzatchkov, V. G. (2006). "Integrating distribution network models with stochastic water demands and mass dispersion." Water Distribution System Analysis #8, American Society of Civil Engineers, Cincinnati, Ohio, USA.

Machell, J., Boxall, J., Saul, A., and Bramley, D. (2009). "Improved Representation of Water Age in Distribution Networks to Inform Water Quality." *Journal of Water Resources Planning and Management*, 135(5), 382-391.

Tzatchkov, V. G., Aldama, A. A., and Arreguin, F. I. (2002). "Advection-dispersion-reaction modeling in water distribution networks." *Journal of Water Resources Planning and Management*, 131(3), 334-342.