Comment on line 1 to 2 (headline)

"Intercomparison of detection and quantification methods for methane emissions from the natural gas distribution network in Hamburg, Germany"

The suction method is not a system for the detection of leaks. To check the pipelines and detect existing leaks, inspections are carried out in Germany in accordance with technical regulations (G465). This was not part of the method comparison.

Comment on line 24 to 26

„The quantitative intercomparison of the emission rates from the three methods at a small number of locations is challenging because of limitations of the different methods at different types of leak locations."

The comparison of the measuring methods has been carried out with few measuring points. The main goal was the scientific exchange. For a representative statement on the sample type and sample size, the measurements would have had to be prepared and carried out consistently and reproducibly. A quantitative comparison is not possible on the basis of the planned 10 measurements.

Comment on line 33 to 39

"The suction method could not be completed or applied at locations with widespread subsurface CH4 accumulation, or due to safety measures, and this sampling bias may be associated with a bias towards leak locations with low emission rates. The leak locations where the suction method could not be applied were the biggest emitters as confirmed by the emission rate quantifications using mobile and tracer methods and an engineering method based on leak's diameter, pipeline overpressure and depth at which the pipeline is buried."

This is not correct. There is no limitation for measurements with the suction method. More time or equipment is needed for large gas accumulations. In other measurement campaigns, large gas accumulations were also measured using the suction method.

Comment on line 98 to 99

"Gas pipelines in a city with the scale of Hamburg are monitored every 5 years with the carpet method. The leak emission rate is not quantified and thus also not a parameter affecting the course of action"

Every 4 years according to national regulation for low pressure lines (HH 6.500 km) and medium pressure lines (HH 250 km). High pressure line monitored every year and additionally controlled by helicopter.

Comment on line 134 to 140

"Suction measurements normally find leak rates that are < 2 L min-1 (E.ON, personal communication, 2020). The reported uncertainty range of this method is ± 10% based on 2 measurements in the 1990s (E.ON, personal communication, 2020). The discrepancy between these rather low leak rates compared to leak rates inferred with the mobile method calls for further investigation, since the suction method is also employed to derive network-wide emission factors for the German country-wide gas distribution network (Federal Environment Agency, 2020)."

See also line 111 to 115: There are stated that 10 % of the leaks are responsible for between 30 % to 70 % of the emissions. Therefore, the average value is not a contradiction.
The emission factors from 1990 were updated by a large-scale national measurement program. Due to investments in the pipeline network (PE pipes, removal of gray cast iron, regular inspections, etc.), emissions have been greatly reduced since 1990. The updated emission factors confirm this.

Comment on line 447

"Tabel 1 Results of gas leak quantification with different methods in Hamburg, Germany"

There is no big difference between the results.

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Comments on line 518-522

„At several of the locations where the mobile method had indicated high emission rates, subsurface accumulation was widespread, and the suction method was either not deployed (n = 3; HH003, HH04, HH011) or the measurements were incomplete (n = 7; HH001, HH002, HH008, HH009, HH010, HH015 and HH101) because of either safety reasons or because the suction team estimated that they would be unable to complete the measurements within a day."

For higher surface accumulatios the measurement with suction method is possible. It takes more time to pump out of the ground via injection ground lances surrounding the underground leaks until an equilibrium CH4 mixing ratio is reached in air out flow. In only a few cases these measurements go beyond one working day. The suction method is the most accurate method in the comparison of the three systems. It is generally known that source-level measurement systems are more accurate than extrapolations from side-level measurements.

Comment on line 575 to 577

"Based on the previous experience at locations with widespread subsurface accumulation it was concluded that the suction method could not be applied at this location. The other case in this category was HH009."

See above – suction method can be applied. In this cases more time was needed. In this field trial the suction team has scheduled only 8 days for 10 measurements. It turns out that this was not enough.

Comments on line 704 to 708

"Although the number of quantified leaks is limited, all the three methods show that the emission rates from category A1 and A2 leaks are higher than category B and C leaks. This indicates that the site selection bias of measurements for the suction method due to safety concerns (see qualifier above), can lead to a bias in the emission rate in this method."

The statement that it is not possible to measure AI or AII safety categorized leakages is not correct. These leaks can also be measured with simultaneous concentration measurement inside the building. This has nothing to do with the methodology. An investigation exclusively in urban areas was not representative. For general statements, different types of pipelines, leaks or environments would have to be considered.

Comments on line 900-904

"Further research is needed to identify the physical mechanism(s) to explain the observed correlation between A1 and A2 leaks and high emission rates. As a hypothesis, the presence of soil cavities associated with leak category A1 may result in higher permeability, i.e. lower underground resistance, which then leads to higher emission rate for the same pipeline hole size compared to locations with no cavity."

Correlations between A1 and A2 leaks as well as B and C leaks could not be formed due to the small number of measured values. Such a result would also be very surprising, as we remain of the opinion that a leak occurs accidentally. It is also random in terms of size and emission intensity, so it cannot be predicted. To explain the categories: The categorization was developed in DE in order to standardize a reaction time based on the distance of a leak to a living area. In the case of A1 and A2 damage, we react immediately because personal protection has absolute priority in this case. This is also prior to proving the measurement accuracy of the source-level measurement method, which is higher than side-level measurement methods.

An emission rate depends on the leak size and the soil permeability for natural gas. In contrast, the soil permeability of natural gas varies and cannot be predicted because very variable soils and soil densities can be found. For a research based statement on this, serial examinations according to a standardized procedure are necessary. In particular, differences in emissions in countries with predominantly sandy soils compared to countries with predominantly loamy soils would be easily explained.

Comments on line 1033 to 1034

"Our results therefore stipulate that representative site selection includes sampling at all leak safety categories (GERG, 2020). Otherwise, this could lead to a sampling and emission rate bias in the national inventory of gas leak CH_4 emission in Germany."

It is generally known that source-level measurement systems are more accurate than extrapolations from side-level measurements. The comparison of side-level measurements with source-level measurement results usually serves to calibrate the less accurate side-level measurement. Since only one source-level measurement system was used in the method comparison, this is a very limited comparison.