

Rainfall nowcasting using Commercial Microwave Links from cellular communication networks

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Motivation

- Rainfall nowcasting has large potential for short-term rainfall and hydrological forecasts in quickly responding (urban) catchments.
- Radar data is normally used, but there is no or not sufficient radar coverage in many areas worldwide.
- Commercial Microwave Links (CMLs) from our cellular communication networks could be an alternative source for nowcasting.

What are the opportunities and limitations of rainfall nowcasting with CML Quantitative Precipitation Estimation (QPE)?

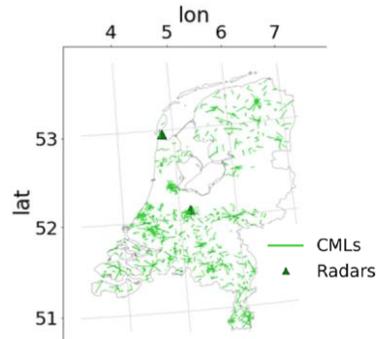
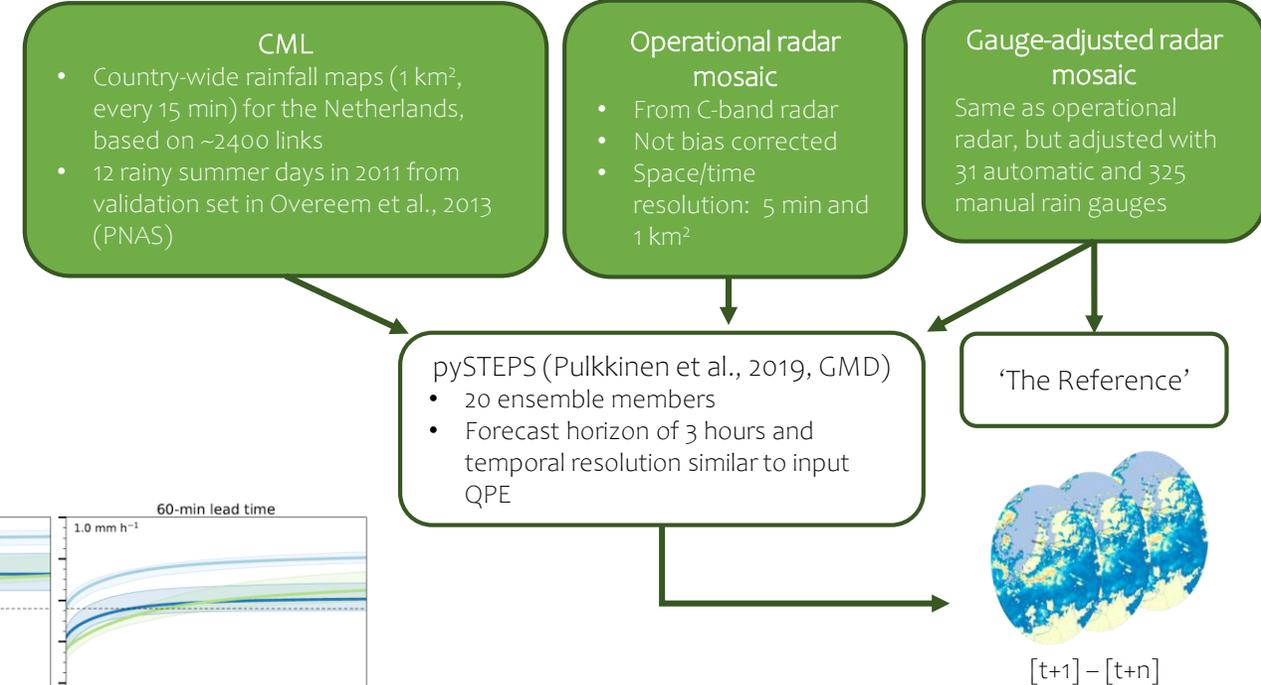


Fig. 1 Locations of the radars and CMLs (as active on 10 Sept 2011, 20:00 UTC)

The method



Results

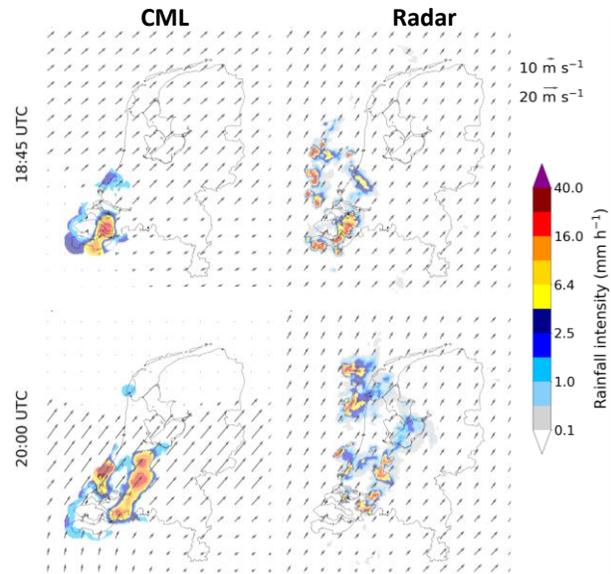


Fig. 2 Advection field derived with the Lucas-Kanade algorithm in pySTEPS at two different issue times on 2011-09-10.

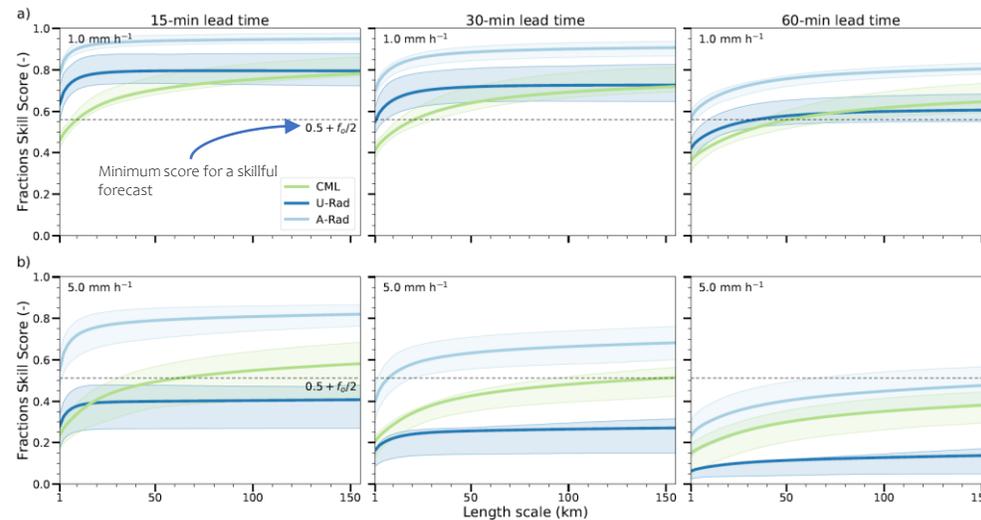


Fig. 3 Average Fractions Skill Score (FSS) of all 15-min nowcasts for 12 events (thick lines, shaded area is the IQR) using three lead times (15, 30, and 60 min; rainfall is accumulated over these intervals up to that lead time) from the rainfall nowcasts constructed with CML data (green), unadjusted radar (U-Rad, dark blue), and adjusted radar (A-Rad, light blue). The FSS is calculated for two thresholds: (a) 1.0 and (b) 5.0 mm/hr.

Conclusions

- Rainfall advection derivation sensitive to regions with low or without CML coverage (Fig. 2).
- For low rainfall intensities, radar rainfall nowcasts outperform CML nowcasts due to a more coherent advection field and more detailed rainfall structures in the QPE (Fig. 3a).
- CML nowcasts for higher rainfall intensities better than the unadjusted radar nowcasts (Fig. 3b).
- CMLs are worldwide available, often also where radar data is absent.