

# Verification of a Radar Derived Surface Precipitation Type Product

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## Introduction

Knowledge of surface precipitation type (i.e. rain, snow, hail) is impactful for flood modelling, numerical weather forecasts, and operational forecasters providing guidance to customers such as the highways agency for gritting. Radars are particularly suited to making high resolution observations of precipitation across a large area with 5 minute scans at 1 km<sup>2</sup> resolution.

*This initial study aims to evaluate the accuracy and skill of the Met Office Radarnet surface precipitation type product over the UK. Here the product is analysed using a novel verification framework being developed as part of the overall PhD project.*

## Product Description

The product has been operational since late 2013 and uses the following data sources as inputs:

- Met Office surface rainfall rate composite (corrected by techniques described in Harrison et al., 2000).
- UKPP model 0°C wet-bulb isotherm height above local surface.

## Verification Data

- 270 Met Office stations in UK.
- Manual (human) and automatic (visiometer, support instruments).
- Reporting "SYNOP" code hourly.
- 300 present weather options.

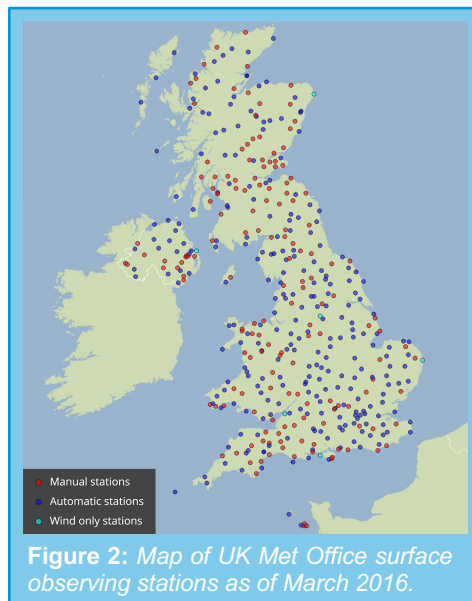


Figure 2: Map of UK Met Office surface observing stations as of March 2016.

## Initial Results

		RADAR						
		no	rain	sleet	wet snow	snow	hail	all
SYNOP	no	2470001	167824	822	2912	6242	0	2647801
	Rain	148044	163321	107	2402	1326	1	315201
	sleet	643	752	17	140	194	0	1746
	wet snow	0	0	0	0	0	0	0
	snow	1966	464	175	153	1014	0	3772
	hail	645	1246	1	30	27	0	1949
all	2621299	333607	1122	5637	8803	1	2970469	

Figure 4: Explicit contingency matrix results. SYNOP never reports wet snow.

		SYNOP						
		no	rain	sleet	wet snow	snow	hail	all
RADAR	Correct	2588091	220530	39	0	1819	2	2790461
	Incorrect	154497	108267	1830	0	2073	1965	268632
TOTAL		2722588	328797	1869	0	3892	1967	3089113
Percentage		94.33%	67.07%	2.09%	—	46.74%	0.10%	91.22%

Figure 5: Implicit results table. Sleet is poorly defined by the SYNOP codes.

## Methodology

Need to cover temporal and spatial uncertainty contributions. Extremes show the possible range of accuracy.

### EXPLICIT

- 1 radar pixel
- 1 scan (xx:00)
- Strict descriptors

### IMPLICIT

- 9 (3x3 km) radar pixels
- 5 scans (xx:00 ± 10 minutes)
- Ambiguous descriptors

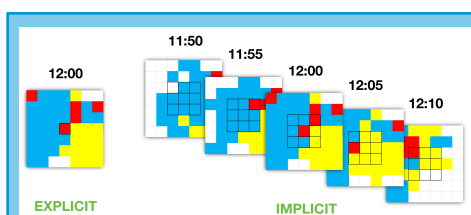


Figure 3: Radar scans ingested for each scheme. Implicit is 'hit' if any (45) pixels matches the surface station report.

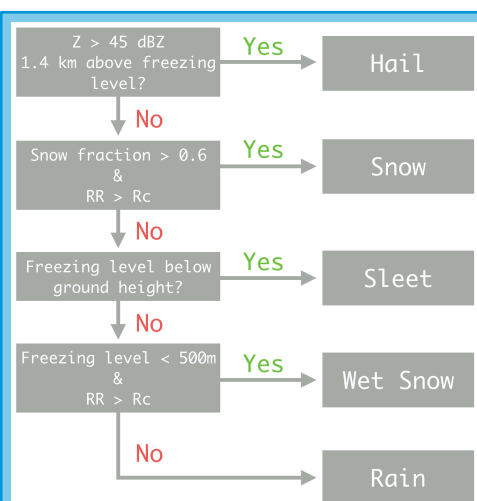


Figure 1: A visual representation of the Boolean logic decision tree process used for the surface precipitation type product.

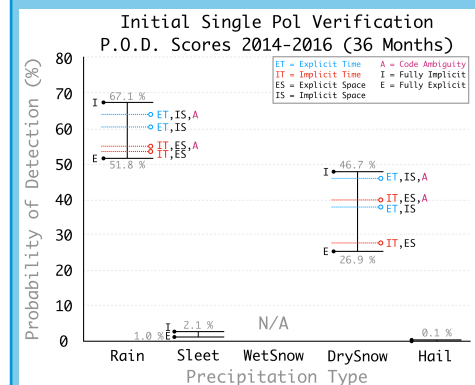


Figure 6: Combined implicit and explicit schemes. Internal are anticipated (future work). Ranges reasonable, method good.

## Future Work

- Continue analysis for multiple-stringency approach, publish paper.
- Apply methods done here to polar, dual-polarisation radar classifiers.

## References

Harrison, D., Driscoll, S. J., & Kitchen, M. (2000). Improving precipitation estimates from weather radar using quality control and correction techniques. *Meteorol. Appl.*, 6, 135–144.