Impact of Radar rainfall on deposition

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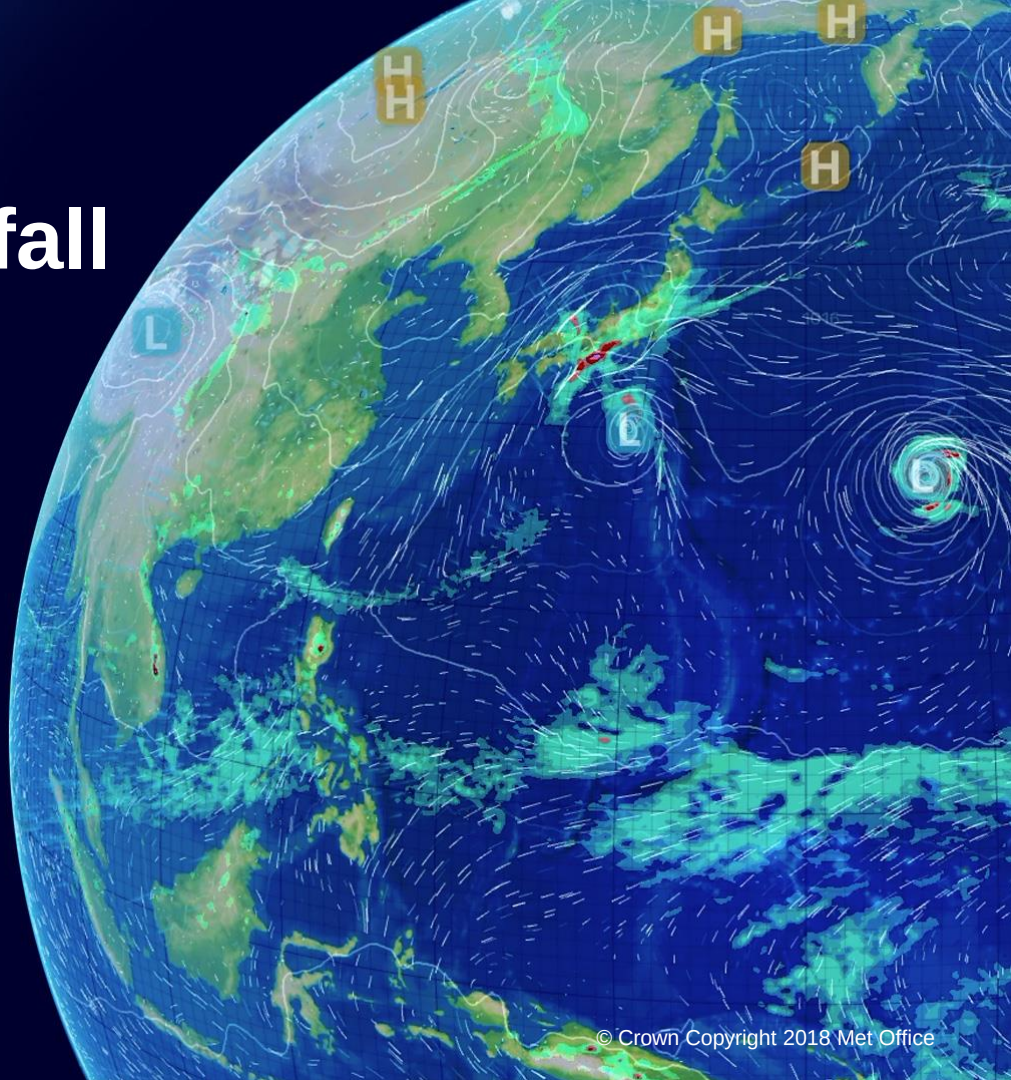
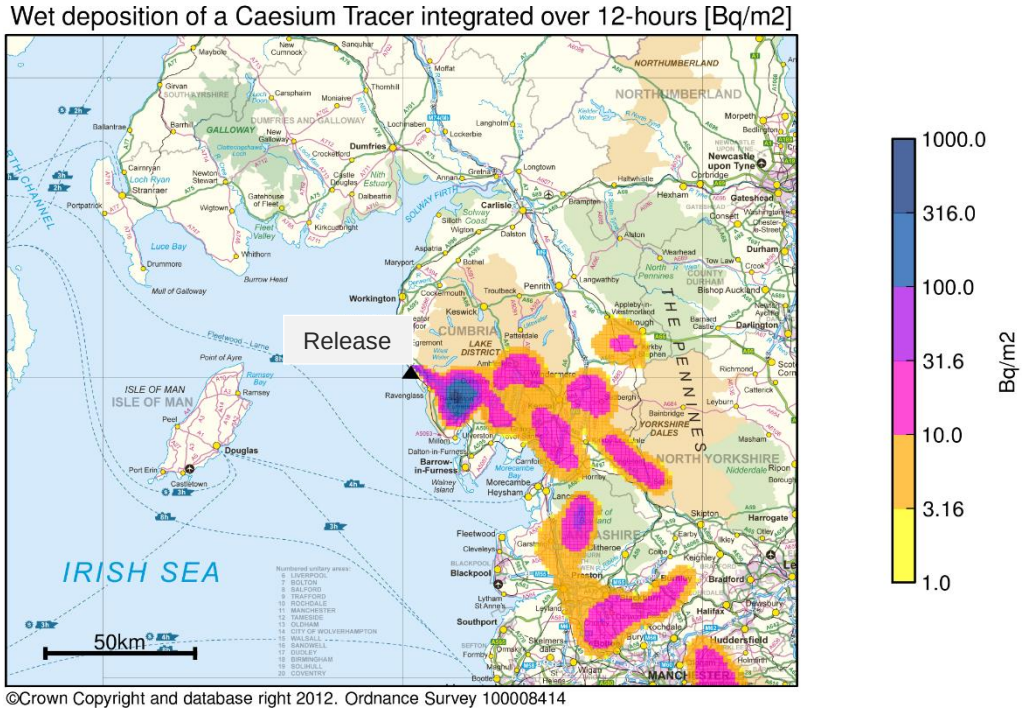


Motivation



- How realistic are these “hot spots”?
- How would I explain this to a decision maker?

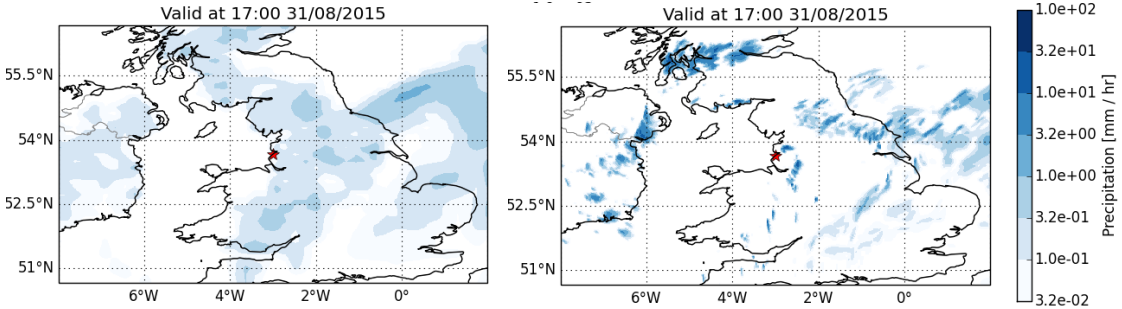
Precipitation and Deposits

- Radiological deposits can have long term impacts
- The location of deposits is highly dependent on precipitation
- Increase in NWP resolution has led to lower grid-point accuracy
- Radar-derived precipitation can be used in place of NWP precipitation

- What is the impact of swapping the NWP precipitation for radar precipitation?
  - On the deposition
  - On the air concentration

Comparing NWP Precipitation

Low resolution versus high resolution



Global (17km)

UKV (1.5km)

Nowcasting (Radar)

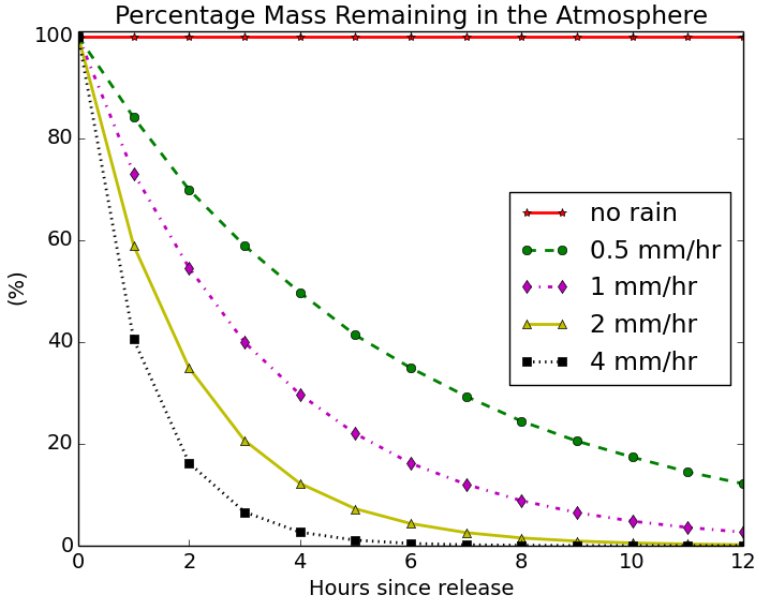
Increasing resolution

- Showers are smoother out at lower resolution

Impact of Precipitation

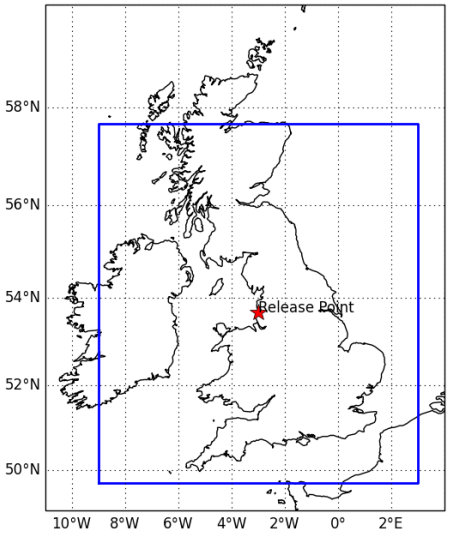
- Instant release at T+0
- No dry deposition
- Precipitation same everywhere
- Scavenging parameters for Cs137 rainout

- At 4mm/hr, >50% of plume removed in 1 hour
- At 0.5mm/hr, 50% of plume removed in ~4 hours

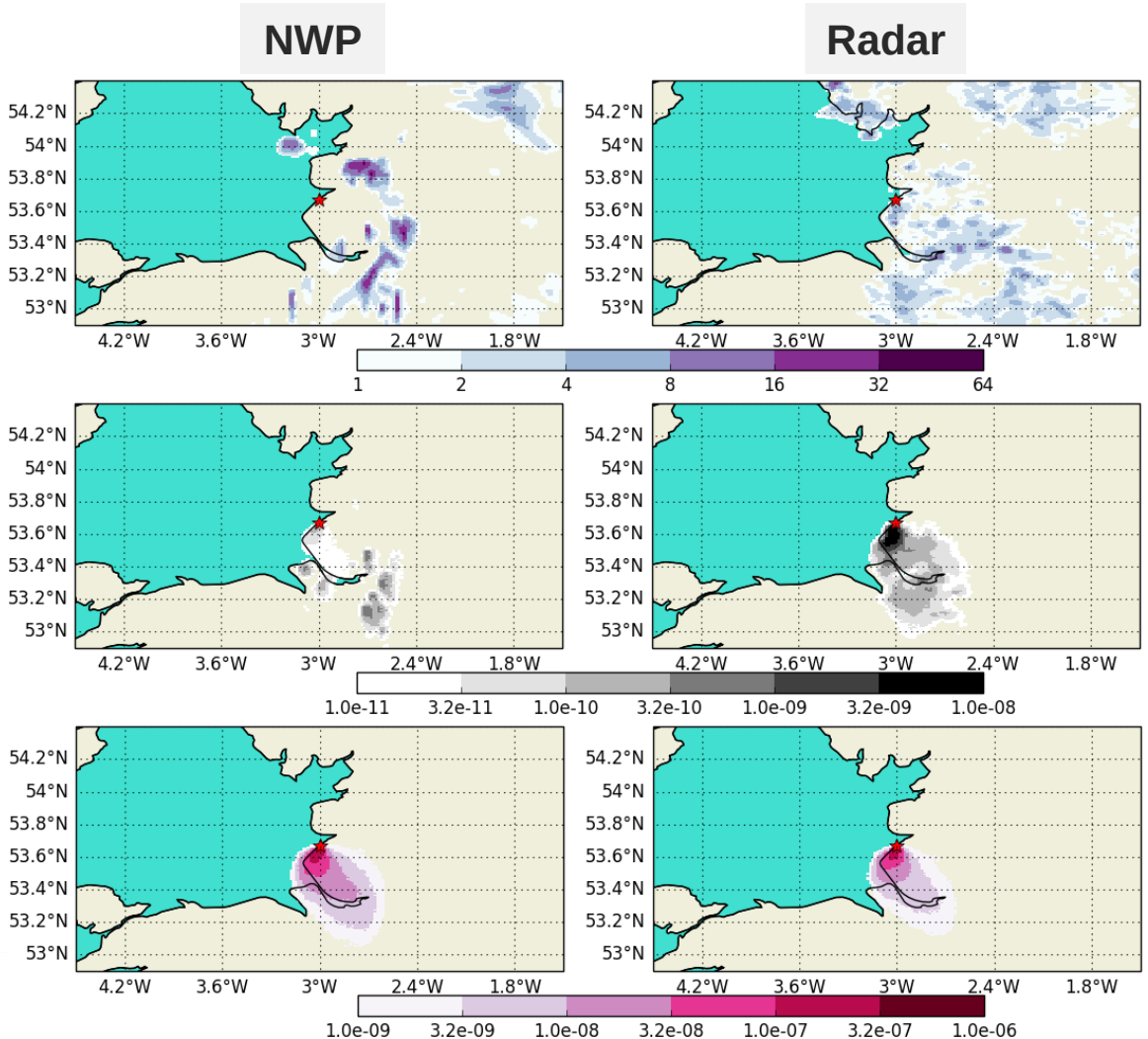


Method

- 1 Bq Caesium-137 released over 1hr
- Examined 6-hour integrated deposition and air concentration
- Dispersion model = NAME
- Met Data = Met Office Unified Model (1.5km)
- Replaced NWP precipitation with UK Radar Rainfall
- Repeated experiment every 25 hours between July 2015 and June 2016



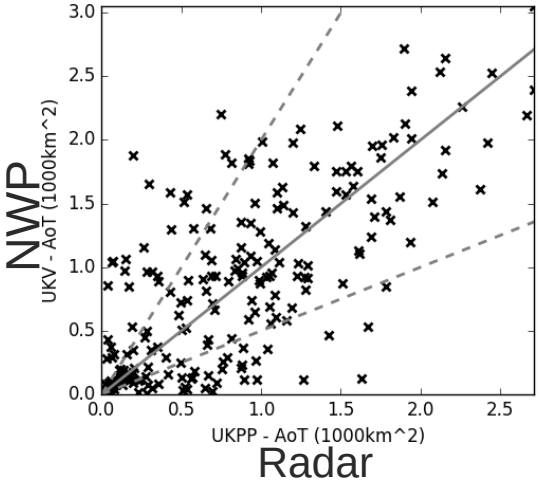
31 August 2015



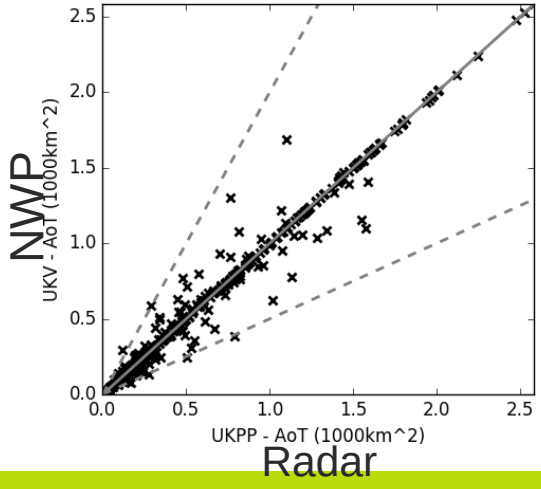
Comparison of Runs

- Considered regions where a threshold is exceeded
- Threshold is $1x10^{-10}$ Bq/m^2 for deposition and $1x10^{-8}$ Bq.s/m^3 for air concentration

- Changing the precipitation data has
  - a big impact on deposition
  - a small impact on air concentration



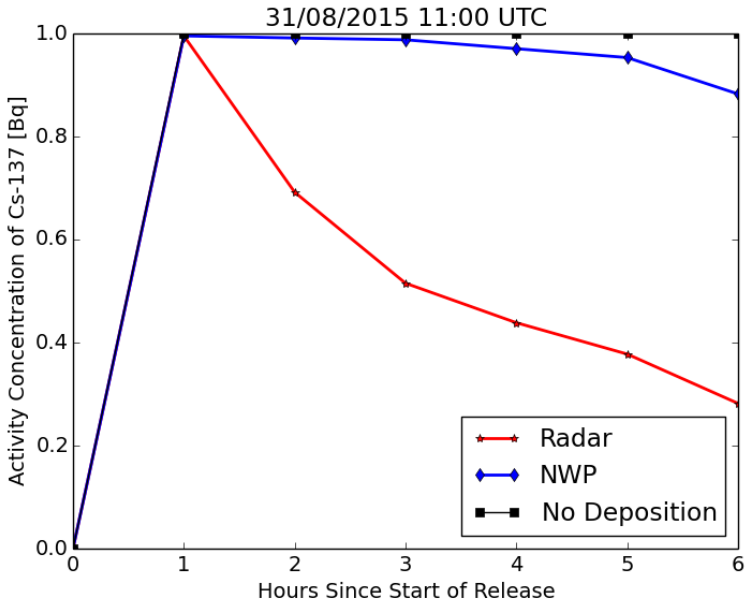
Deposition



Air Concentration

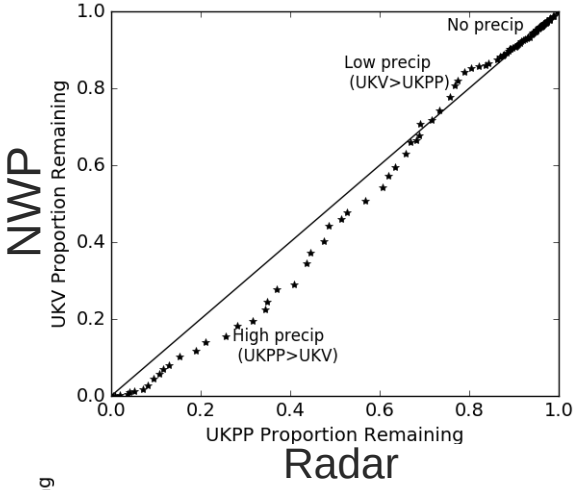
Activity Remaining – 31 August 2015

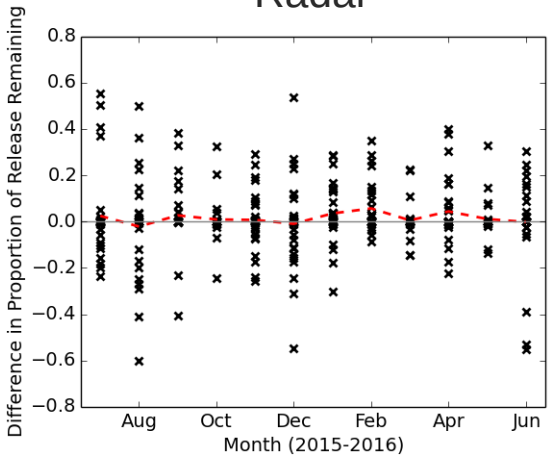
- Material is released over 1 hour
- Material is removed by wet and dry deposition
- In this case
  - Around ~90% of plume remains in atmosphere when using NWP precipitation
  - <30% of plume is remains in atmosphere when using radar precipitation



Mass Depletion – All Runs

- When precipitation is modest, proportion remaining is higher with NWP than radar
- When precipitation is high, proportion remaining is higher with radar than NWP
- Mean difference is close to zero
- But…
- There is a small bias; radar runs lose less material by deposition.





Summary and Next Steps

- Changing from NWP to Radar has
  - A large impact on estimates of deposition
  - A smaller impact on estimates of air concentration
- Study is limited to a region where Radar coverage is good and NWP resolution is high – so probably an upper bound

- Ensemble NWP may provide a better prediction of precipitation and thus of deposition

Any Questions?