# User Survey to Assess Requirements, Standards and Utilisation of Smoke Forecast Information

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Smoke dispersion forecasts attempt to predict the effects of low-level wind speed, turbulence, temperature and humidity on a column of smoke using information contained in the Bureau of Meteorology's numerical weather prediction (NWP) models.
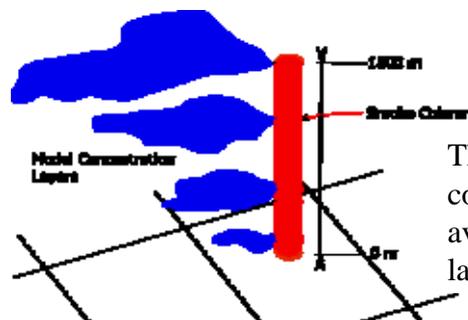


The plotted smoke concentration is an average of 4 grid layers

Smoke Dispersion Forecast calculations currently assume a 1500m vertical line source (smoke column).

## Smoke Forecasts :

• Have been available for ~5 years
• Are produced every 12 hours
• Have focused on prescribed burns.

## User survey undertaken to establish:

• How forecasts are being used?
• Are forecasts meeting requirements and standards?
• Are changes or additional information needed?

# Survey method

•Site visit interviews

   -Allowed for better interactive discussion

•42 questions

•16 respondents representing Victoria, Tasmania and Western Australia

•5 survey categories

   –Usefulness

   –Requirements

   –Standards

   –Barriers to use

   –Other needs

## Results: Usefulness

• Potential smoke impacts

• Disruption to outdoor social or work activities

• Economic (vineyards)

• Nuisance (public complaints)

• Health

• Visibility (visual aesthetics)

• Transportation

## Usefulness

• Primary decision is to burn or not to burn

• 62% indicated smoke forecast is important for decision-making

• 81% indicated smoke forecast influences decision

• The value of the forecasts are:

 –Enhanced or reinforced decision-making

 –Timeliness and accuracy

• 62% indicated using the forecasts daily during burn season

# Requirements

- Needed information:
  - Plume rise/height
  - Transport/trajectory
  - Dispersion
  - Concentration values
  - Background residual smoke
  - Meteorological elements (wind fields, inversion height…)
- Forecasts are desired to be highly accurate given importance of final burn decision

- National Environmental Protection Measure provides PM guidelines

# Standards (accuracy)

- All respondents indicated that the forecasts are sufficiently accurate for operational usage
- Respondents define accuracy as agreement between the observed smoke plume and the model forecast
- Sea breeze, troughs and low wind speeds were cases cited as being most problematic for the smoke forecasts.
  - these are also problems for the underlying NWP model (potential research topics)

# Standards (uncertainty)

- All respondents desire forecast uncertainty information via forecaster provided text or phone discussion
- 81% of respondents would use a probability based smoke forecast
  - Graphical display most desired
- Current forecast period (24-hours) sufficient
  - Up to 4 days could be useful for some planning
- Current hourly forecasts sufficient

# Barriers to use (forecasts)

- 62% find the current information content of the forecasts adequate
  - A number of enhanced/ new products are desired
- 75% indicate the current display is adequate
  - A number of display enhancements were also suggested
- Access to the forecasts is adequate
- Distribution of the forecast information is adequate
- Overall there is very little smoke forecast assistance or training directly available within the organisations

# Barriers to use (value)

- Most respondents indicated understanding past forecast performance is important
- Majority indicated quantitative verification is important
  - Difficult to acquire observations, reliance on satellites
- 81% indicated that demonstrated value of smoke forecasts is very important
  - Supports scientific based decisions and public credibility
- Other operational and political factors can readily outweigh smoke forecast

# Barriers to use

- Forecasts are sufficiently accurate to use regularly
- Most of the respondents indicated no significant forecast inconsistencies
- Nearly half of respondents indicated desire for additional forecast information

# Other needs

- Forecasts are considered of high value, so no additional information is needed to change usage
- New related scientific studies will improve and support decisions and provide education
- Expert assistance is desired via discussions with forecasters
- Information on the vertical distribution of smoke is also desired

# Other needs (training)

- Meteorological training related to smoke is desired
- BMRC smoke training module needs to be updated and distributed more broadly
- There is very little formal smoke management training available
  - Perhaps a good time to develop a specific course

# Action Items

1. Training

2. Forecast Accuracy (uncertainty?)

3. Quantitative Verification

4. Improve Displays