Fighting smoke with smoke: Prescribed burning and human health

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Planned burns and poor air quality in NSW

Mt Solitary Burn 8th May 2018 3500 ha

Sydney May 9th 2016
The OEH Bushfire research hub project: The trade-off between prescribed and wildfire smoke

- $900k funding over 5 years from the NSW Office of Environment and Heritage
- Measuring particulate emissions from prescribed and wildfires
  - Fine-scale spatial measurements
  - Exploring the causes of variability of emission factors
  - Measuring fuel consumption in prescribed and wildfires
- Analysis of historical smoke patterns from individual fires
- Evaluating smoke dispersion modelling
- Ultimately scenario modelling with different levels of prescribed burning

Currently 9 months into the project
Smoke Monitoring at Prescribed Burns
5 so far from a planned 40
Spatial patterns in smoke

Wilson's Creek 138 ha, 17/4/2019

Girronba 98 ha, 10/3/2019
Variation in emissions

Girronba fire, Heathcote NP 10/3/2019

Back Run Creek fire, Moreton NP 10/3/2019
Fuel Consumption
So far, pre-fire fuel measured in 16 fires, post in 2
Smoke Plumes observed on MODIS imagery
(Steph Samson)
Study 4: Air Quality Under the Plume  
(Simin Rahmani student project)

- Examined 256 plumes mapped from MODIS and 126 from radar n= (382)
- 68 cases where a mapped plume was above a NSW AQ monitor (41 radar, 27 MODIS)
- 10 cases were HR burns
- Mean increase in PM10 ~ 8 μgm⁻³ cf day before
- 12 cases where PM10 > 50 μgm⁻³ for at least 3 hour period
- 1 HR burn caused night-time inversion with PM10 (212 μgm⁻³)
Components of Air Quality in Auburn: (Maximilien Desservettaz)

- Open Path Fourier Transform Spectrometer project
- Examined pollutants from 1 year of air quality data from Auburn, Sydney
- Compared 42 Domestic Wood Heating days and 4 Prescribed Burning days
- Found heaters had larger impact

| Table 2. 1h averaged enhanced levels above background (1hΔC) and total enhanced levels (Σ1hΔC) from domestic wood heating and hazard reduction burns events, as measured at the Auburn site between June and September 2017. |
|-------------------------------------------------|-------------------|-------------------|
| Domestic Wood Heating                          | Hazard Reduction Burns |
| average 1hΔC                                   | average 1hΔC       | Σ1hΔC (42 events) | Σ1hΔC (4 events) |
| CO₂ (ppm)                                      | 35                | 17,500            | 36                | 6,797            |
| CO (ppb)                                       | 412               | 208,000           | 420               | 74,354           |
| CH₄ (ppb)                                      | 466               | 235,000           | 499               | 93,700           |
| CH₂OH (ppb)                                    | 2                 | 1,130             | 4                 | 779              |
| NH₃ (ppb)                                      | 4                 | 1,880             | 4                 | 784              |
| C₂H₂ (ppb)                                     | 2                 | 829               | 1                 | 288              |
| C₂H₄ (ppb)                                     | 4                 | 1,900             | 4                 | 651              |
| C₃H₆ (ppb)                                     | 8                 | 4,280             | 12                | 2,210            |
| CH₃O (ppb)                                     | 2                 | 942               | 3                 | 581              |
| NO (ppb)                                       | 38                | 17,800            | 32                | 6,370            |
| NO₂ (ppb)                                      | 15                | 7,040             | 19                | 3,510            |
| NOₓ (ppb)                                      | 52                | 24,400            | 50                | 9,680            |
| PM₂.₅ (µg/m³)                                   | 12                | 5,820             | 23                | 3,870            |
| PM₁₀ (µg/m³)                                    | 14                | 7,300             | 26                | 4,500            |
| SO₂ (ppb)                                      | 1                 | 536               | 1                 | 214              |
Initial Analysis of Historical Air Quality Data

ANSTO Ion Beam Analysis
Biomass burning PM2.5 mass

PM2.5 from OEH Air Quality Network data
Association between exceedance and temperature inversion
Thanks for listening
Find out more at the Hub Conference