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Supplement of

Impacts of an intense wildfire smoke episode on surface radiation, energy and carbon fluxes in southwestern British Columbia, Canada

Ian G. McKendry et al.

Correspondence to: Ian G. McKendry (ian@geog.ubc.ca)

1. Sites

Figure S1: Sites - clockwise from top left: Burns Bog, Vancouver-Sunset, Buckley Bay, UBC

2. Instrumentation and Data Processing

Measurement	Site	Instrument	Model	Manufacturer	Height above ground (m)
Shortwave Irradiance	Buckley Bay	4-Component Net Radiometer	CNR1	Kipp and Zonen, Delft, The Netherlands	15
	Burns Bog	4-Component Net Radiometer	CNR1	Kipp and Zonen, Delft, The Netherlands	4.25
	Vancouver-UBC	Pyranometer	CM21	Kipp and Zonen, Delft, The Netherlands	1.5
	Vancouver-Sunset	4-Component Net Radiometer	CNR1	Kipp and Zonen, Delft, The Netherlands	26.2
Reflected Shortwave radiation	Buckley Bay	4-Component Net Radiometer	CNR1	Kipp and Zonen, Delft, The Netherlands	15
	Burns Bog	4-Component Net Radiometer	CNR1	Kipp and Zonen, Delft, The Netherlands	4.25
	Vancouver-UBC	Pyranometer	CM21	Kipp and Zonen, Delft, The Netherlands	1.5
	Vancouver-Sunset	4-Component Net Radiometer	CNR1	Kipp and Zonen, Delft, The Netherlands	26.2
Longwave irradiance	Buckley Bay	4-Component Net Radiometer	CNR1	Kipp and Zonen Delft, The Netherlands	15
	Burns Bog	4-Component Net Radiometer	CNR1	Kipp and Zonen Delft, The Netherlands	4.25
	Vancouver-UBC	Pyrgeometer	PIR	Eppley Laboratory Inc., Newport, USA	1.5
	Vancouver-Sunset	4-Component Net Radiometer	CNR1	Kipp and Zonen Delft, The Netherlands	26.2
Emitted longwave radiation	Buckley Bay	4-Component Net Radiometer	CNR1	Kipp and Zonen Delft, The Netherlands	15
	Burns Bog	4-Component Net Radiometer	CNR1	Kipp and Zonen Delft, The Netherlands	4.25
	Vancouver-UBC	Pyrgeometer	PIR	Eppley Laboratory Inc., Newport, USA	1.5
	Vancouver-Sunset	4-Component Net Radiometer	CNR1	Kipp and Zonen,	26.2
PAR	Burns Bog	Quantum sensor	LI-190	LI-COR Inc., Lincoln, NE, USA	4.25
Wind components and sensible heat flux	Buckley Bay	Ultrasonic anemometer–thermometer	R3	Gill instruments Ltd., Lymington, UK	15
	Burns Bog	Ultrasonic anemometer–thermometer	CSAT-3	Campbell Scientific Inc. (CSI), Logan, UT, USA	1.8
	Vancouver-Sunset	Ultrasonic anemometer–thermometer	CSAT-3	Campbell Scientific Inc. (CSI), Logan, UT, USA	28.8
CO_2 concentration and fluxes	Buckley Bay	Infared gas analyzer	LI-7200	LI-COR Inc., Lincoln, NE, USA	15
	Burns Bog	Infared gas analyzer	LI-7500	LI-COR Inc., Lincoln, NE, USA	1.8

H₂O concentration and fluxes	Buckley Bay	Infared gas analyzer	LI-7200	LI-COR Inc., Lincoln, NE, USA	15
	Burns Bog	Infared gas analyzer	LI-7500	LI-COR Inc., Lincoln, NE, USA	1.8

Flux data processing and corrections		
	Buckley Bay	Matlab, Fluxnet Canada (Morgenstern et. al. (2004), Humphreys et. al. (2006).
	Burns Bog	SmartFlux, Lee at al. (2017)
	Vancouver-Sunset	Crawford et al. (2012)

Figure S2: arrival of smoke on 5 July looking north across Downtown Vancouver compared to clear day (Photo courtesy from Elie Bou-Zeid, Princeton University)
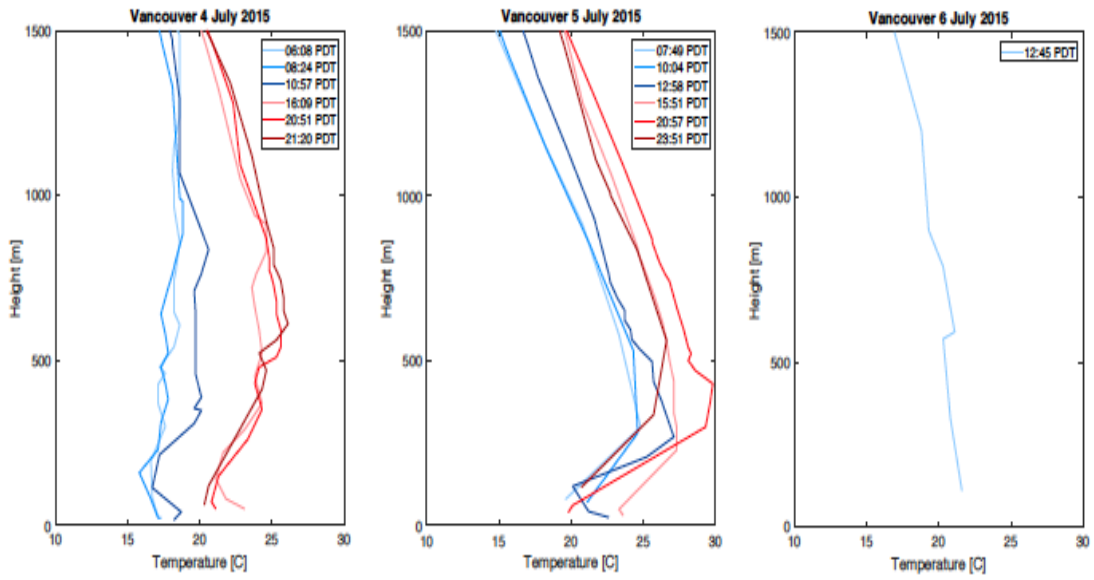
3. AMDAR:

Figure S3 – vertical profiles from AMDAR

4. HYSPLIT Modelling of the Event

Dispersion was modeled in order to confirm the smoke source using the NOAA Air Resources Laboratory HYSPLIT (HY-brid Single-Particle Lagrangian Integrated Trajectory) model Version 4 (https://ready.arl.noaa.gov/HYSPLIT.php). HYSPLIT 4 is the current version of a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations for any location and date (depending on data availability) using a variety of standard data input products (e.g. the NCEP Reanalysis 1948–present). For this case, the concentration fields were calculated for 24 hours for a fire source located at Elaho, covering 10000 ha and started at 0000 05 July 2015 UTC. Concentrations were averaged through a 1500m layer AGL with meteorology driven by the EDAS40 dataset.
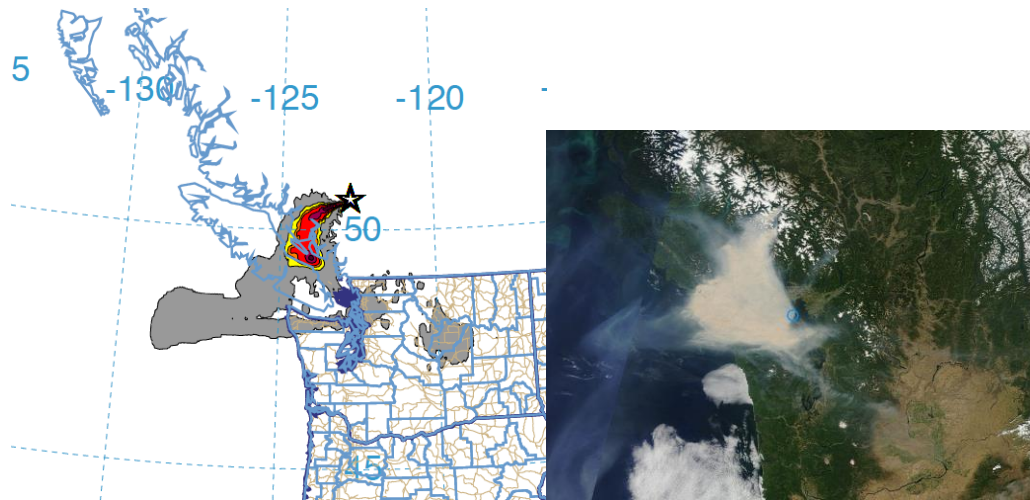

Figure S4: Modelled and observed 5 July: HYSPLIT run – 10,000 Ha, EDAS, 1500 m averaged 24 hour started 0000 5 July, UTC

References

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