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Supplement of

Air quality simulations of wildfires in the Pacific Northwest evaluated with surface and satellite observations during the summers of 2007 and 2008

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Table S1: Details of the largest fires reported during the analysis periods (July 3 – August 22, 2007 and June 22 – August 27, 2008). Locations are indicated by the National Forest (NF) affected if applicable. Fires not completely contained before the end of analysis period are marked (*). The area burned reported here is only an approximate of the area burned during the analysis period thus fires not completely contained before the end of the analysis period likely burned additional area not included below.

Ignition Date(s)	Days to Contain	Fire/Complex Name	Location	State(s)	Acres Burned
2007					
July 6	18	Egley Complex	north of Riley	OR	140k
July 6	*	East Zone Complex	Payette NF, Boise NF	ID	200k
July 6	*	Rattlesnake Complex	Nez Perce NF	ID	90k
July 16	19	Murphy Complex	southwest Idaho, northeast Nevada	ID, NV	652k
July 16	*	Cascade Complex	Boise NF, Payette NF, Salmon-Challis NF	ID	211k
July 16	9	Hepworth Complex	surrounding Wells	NV	58k
July 29 - Aug 2	*	Shower Bath Complex	Salmon-Challis NF	ID	100k
July 29 - Aug 2	*	Chippy Creek Fire	Kootenai NF	ID, MT	96k
July 29 - Aug 2	*	Sawmill Complex	Lolo NF, Beaverhead-Deerlodge NF	MT	55k
July 29 - Aug 2	*	Fool Creek Fire	Lewis-Clark NF	MT	60k
July 29 - Aug 2	*	Jocko Lakes Fire	surrounding Seeley Lake	MT	35k
July 29 - Aug 2	*	Brush Creek Fire	Flathead NF	MT	30k
2008					
June 21	*	Iron-Alps Complex	Shasta-Trinity NF	CA	100k
June 21	*	Lime Complex	Shasta-Trinity NF	CA	65k
June 21	*	Klamath Theater Complex	Klamath NF	CA	50k
June 21	*	Shu Lightning Complex	Shasta-Trinity NF	CA	20k

Table S2: 2007 Daily AOD Log

	LANCE-MODIS			MODIS AOD AQUA vs AIRPACT-3							
	Conditions			Co-located Sources			Mis-located Sources		Transport Under-predicted		
	Clear Skies	Wind (from)	Fire Impact	Under-predict	Predict well	Over-predict	Not Predicted	Not Observed	Inside domain	Outside domain	Prior Day Loading
7/3/2007	Yes	SW	None								
7/4/2007	Yes	S	Low							YES	
7/5/2007	Yes	SW	Low			1	1	1			
7/6/2007	No	SW	Med	1	1				YES		
7/7/2007	W	SW	Med	3						YES	
7/8/2007	Yes	NW	High	3	3		2	1		YES	
7/9/2007	Yes	W*E	Med	3		1	1		YES	YES	
7/10/2007	N	W	Med	3				2	YES	YES	
7/11/2007	NE	Calm	Med	2	3						YES
7/12/2007	No	S	Low	1							
7/13/2007	S	Calm	Low	1	2				YES		
7/14/2007	No	SW	Low	1	1		1		YES		
7/15/2007	No	SW	Med				2		YES		
7/16/2007	S	SW	Med	3	1	1			YES		
7/17/2007	No	S	N/A								
7/18/2007	E	S	Med	2	1		2		YES	YES	
7/19/2007	SE	SW	Low	2		1			YES		
7/20/2007	E	SW	Med	2					YES		
7/21/2007	SE	SW	Med	2			1		YES		
7/22/2007	E	SW	High	3	2	1					
7/23/2007	No	SW	Med	1	3				YES		
7/24/2007	No	SW	Low		1						
7/25/2007	W	Calm	Low		2	2					
7/26/2007	W	Calm	Med	1	1	1			YES		
7/27/2007	W	Calm	Low	1	1	1					
7/28/2007	Yes	Calm	Low		1	3					
7/29/2007	N	SW	Med	1	2	2			YES		
7/30/2007	W	SW	Low	1	2	1			YES		
7/31/2007	Yes	W	Low	1	3	2					
8/1/2007	Yes	Calm	High	3	1	4		2	YES		
8/2/2007	N	SW	High	1	2	1	1		YES		
8/3/2007	W	SW	High	3	1		1		YES		
8/4/2007	S	SW	High	1			2		YES		YES
8/5/2007	No	SW	High	1	2				YES		
8/6/2007	No	SW	Med	1	1						
8/7/2007	No	SW	N/A								
8/8/2007	S	SW	Low	2	1						
8/9/2007	No	SW	Med	1	1	1					
8/10/2007	S	W	Low	1		1					
8/11/2007	Yes	SW	Low	1	2	1					
8/12/2007	Yes	SW	High	3		1		1	YES		
8/13/2007	Yes	SW	High	2	2	2			YES		
8/14/2007	Yes	W	High	2	2	2		1		YES	
8/15/2007	W	W	High	1	2	3					
8/16/2007	W	SW	Med	1	2	1				YES	
8/17/2007	No	SW	High	1	2	1					
8/18/2007	S	SW	High	2	1	1		1	YES		
8/19/2007	No		N/A								
8/20/2007	No		N/A								
8/21/2007	No	W	N/A								
8/22/2007	No		N/A								
			Totals	65	52	36	14	9	23	8	2

Table S3: 2007 Daily NO_2 Log

	OMI Trop. NO2 vs AIRPACT-3						
		Co-located Sources			Mis-located Sources		Missed
	NO2 Magn.	Under-predict	Predict well	Over-predict	Not Predicted	Not Observed	Prior Day Loading
7/3/2007							
7/4/2007							
7/5/2007							
7/6/2007	Low			2			
7/7/2007	Med		2	1			
7/8/2007	Mixed	2	2	2		1	
7/9/2007	Mixed	1	1	1		1	
7/10/2007							
7/11/2007	Mixed	1	1	1			
7/12/2007							
7/13/2007	Low	1	2	2			
7/14/2007	Mixed	1		1			
7/15/2007	Mixed	1	2				
7/16/2007	Mixed	2	2	1		1	
7/17/2007	Low	1		1			
7/18/2007	Mixed	5		1			
7/19/2007	Mixed	1	1	3			
7/20/2007	Mixed	5	1	1			
7/21/2007							
7/22/2007	Low	2	1	2			
7/23/2007	Low	1		4			
7/24/2007							
7/25/2007	Low		1	1		2	
7/26/2007							
7/27/2007	Low			2		1	
7/28/2007							
7/29/2007	Mixed		1	3			
7/30/2007							
7/31/2007	Med	1	2	1			
8/1/2007							
8/2/2007	Low			3			
8/3/2007	Mixed		1	1			
8/4/2007	Low	1					
8/5/2007	Low			1		1	
8/6/2007	Med	1					
8/7/2007							
8/8/2007							
8/9/2007	Med		1	1		1	
8/10/2007	Mixed		1	3		1	
8/11/2007	Low		2	3			
8/12/2007	Mixed		2	4		1	
8/13/2007							
8/14/2007	Low			6			
8/15/2007							
8/16/2007	Mixed	1		2			
8/17/2007							
8/18/2007	Mixed			4			
8/19/2007							
8/20/2007							
8/21/2007							
8/22/2007							
	Totals	28	26	58	0	10	0

Table S4: 2008 Daily AOD Log

	LANCE-MODIS			MODIS AOD AQUA vs AIRPACT-3							
	Conditions			Co-located Sources			Mislocated Sources		Transport Under-predicted		
	Clear Skies	Wind (from)	Fire Impact	Under-predict	Predict well	Over-predict	Not Predicted	Not Observed	Inside Domain	Outside Domain	Prior Day Loading
6/22/2008	No	SW	Low			1					
6/23/2008	S	SW	Med		1					YES	
6/24/2008	Yes	SW	High	1					YES	YES	
6/25/2008	S	SW	High				1		YES	YES	
6/26/2008	SW	Calm	Med	1					YES	YES	
6/27/2008	Yes	NE	Med			1				YES	
6/28/2008	Yes	NE*SW	Med		1					YES	
6/29/2008	Yes	S	Med	1					YES	YES	
6/30/2008	No	S	Med	1					YES		
7/1/2008	No	S	Med	1		1		1	YES	YES	YES
7/2/2008	S	S	High	2			1		YES	YES	
7/3/2008	S	SW	Med	1			1		YES	YES	
7/4/2008	No	SW	Low	1					YES		
7/5/2008	No	SW	N/A								
7/6/2008	SW	NE	Low	1		1					YES
7/7/2008	Yes	Calm	Low		1						
7/8/2008	Yes	E	Med		1					YES	
7/9/2008	Yes	NW*	Med	1				1	YES	YES	
7/10/2008	Yes	W*	Med		1					YES	
7/11/2008	Yes	NE	Med	1					YES	YES	YES
7/12/2008	Yes	W*	Med	1				2	YES	YES	
7/13/2008	Yes	W*	Med	1	1				YES	YES	
7/14/2008	No	S*W	Med		2						
7/15/2008	W	SW	High	2					YES	YES	
7/16/2008	W	SW	Med	1	1				YES	YES	
7/17/2008	Yes	SW	Med		2				YES	YES	
7/18/2008	Yes	SW	Med	1					YES	YES	
7/19/2008	Yes	SW*	Med	1		1			YES	YES	
7/20/2008	N	S*SW	Med	1		1			YES		
7/21/2008	No	SE*SW	Med	1					YES		
7/22/2008	No	S*	Med	1					YES	YES	
7/23/2008	S	SW	Med	1					YES	YES	
7/24/2008	Yes	S	Med	1					YES	YES	
7/25/2008	Yes	SW*S	Med	1					YES		
7/26/2008	S	SW	Med	1					YES	YES	
7/27/2008	S	SW	Med			1			YES		
7/28/2008	Yes	S*W	Low		1				YES	YES	
7/29/2008	No	SW	Med		1						
7/30/2008	Yes	SW	Low		1				YES	YES	
7/31/2008	Yes	SW	Med			1					
8/1/2008	S	SW	Med	1							
8/2/2008	S	SW	Low		1						
8/3/2008	Yes	Calm	Med		1						
8/4/2008	Yes	S*W	Med			1			YES		
8/5/2008	Yes	S*W	Med		1						
8/6/2008	No	S	Med	1		1			YES		
8/7/2008	No	S	Med		1				YES		
8/8/2008	No	S	Med		1				YES		
8/9/2008	S	SW	Low		1	1					
8/10/2008	S	Calm	Med	1			1				
8/11/2008	Yes	Calm	Low			1					
8/12/2008	S	Calm	Low	1	1						
8/13/2008	W	SE	Low			1					
8/14/2008	Yes	SE	Low		2	1					
8/15/2008	Yes	SE*SW	Med				1				
8/16/2008	Yes	Calm	Low	1	3	2		1	YES		
8/17/2008	E	S	Med	2	1			1	YES		
8/18/2008	E	S	Med		2		1				
8/19/2008	No	N/A	N/A								
8/20/2008	No	SW	Low			1		1			
8/21/2008	S	SW	Low		1			2			
8/22/2008	S	Calm	Low		1			2			
8/23/2008	E	SW	Low		1			2			
8/24/2008	No	SW	Low			1					
8/25/2008	E	SW	Low	1	1						
8/26/2008	S	Calm	None			1					
8/27/2008	S	W	Low	1	1			1			
			Totals	35	34	19	6	14	34	27	3

Table S5: 2008 Daily NO_2 Log

	OMI Trop. NO2 vs AIRPACT-3						
		Co-located Sources			Mis-located Sources		Missed
	NO2 Magn.	Under-predict	Predict well	Over-predict	Not Predicted	Not Observed	Prior Day Loading
6/22/2008							
6/23/2008	Low			1			
6/24/2008							
6/25/2008	Low	1					
6/26/2008	Low	1					
6/27/2008	Low			1			
6/28/2008	Low		1				
6/29/2008	Med	1					
6/30/2008	Mixed		1		1		
7/1/2008	Mixed	1		1	1		YES
7/2/2008	Low		1				
7/3/2008							
7/4/2008	Low	1	2				
7/5/2008							
7/6/2008	Low		1	1			
7/7/2008	Low			1			
7/8/2008	Low			1			
7/9/2008	Med			1			
7/10/2008							
7/11/2008	Med		1				
7/12/2008							
7/13/2008	Mixed		2	2			
7/14/2008	Low			1			
7/15/2008	Low		1				
7/16/2008	Low			1			
7/17/2008							
7/18/2008	Low		1				
7/19/2008							
7/20/2008	Mixed		1	2		1	
7/21/2008	Low			2			
7/22/2008							
7/23/2008							
7/24/2008	Low		1				
7/25/2008	Low			1		1	
7/26/2008							
7/27/2008	Low			1			
7/28/2008							
7/29/2008	Low			1			
7/30/2008	Low			1			
7/31/2008	Low		1				
8/1/2008	Low			1			
8/2/2008							
8/3/2008	Low			1			
8/4/2008							
8/5/2008	Med				1		
8/6/2008							
8/7/2008	Low	1					
8/8/2008	Low			1			
8/9/2008							
8/10/2008							
8/11/2008							
8/12/2008	Low		1				
8/13/2008							
8/14/2008	Low		1			2	
8/15/2008							
8/16/2008	Low	1	1			1	
8/17/2008	Low			1			
8/18/2008	Low	1	2				
8/19/2008	Low			1		1	
8/20/2008	Low			2		1	
8/21/2008	Low		1	1		1	
8/22/2008							
8/23/2008	Low	1	2				
8/24/2008							
8/25/2008	Mixed		1	1		2	
8/26/2008	Low	1				2	
8/27/2008							
	Totals	10	23	28	3	12	1

Fig. S1: Fire events with individual burn areas greater than 5000 acres during the analysis periods of 2007 (orange) and 2008 (red), with labels of the largest fires listed in Supplemental Table 1. Total fuel loading derived from the FCCS v1 is also shown for the AIRPACT-3 domain.

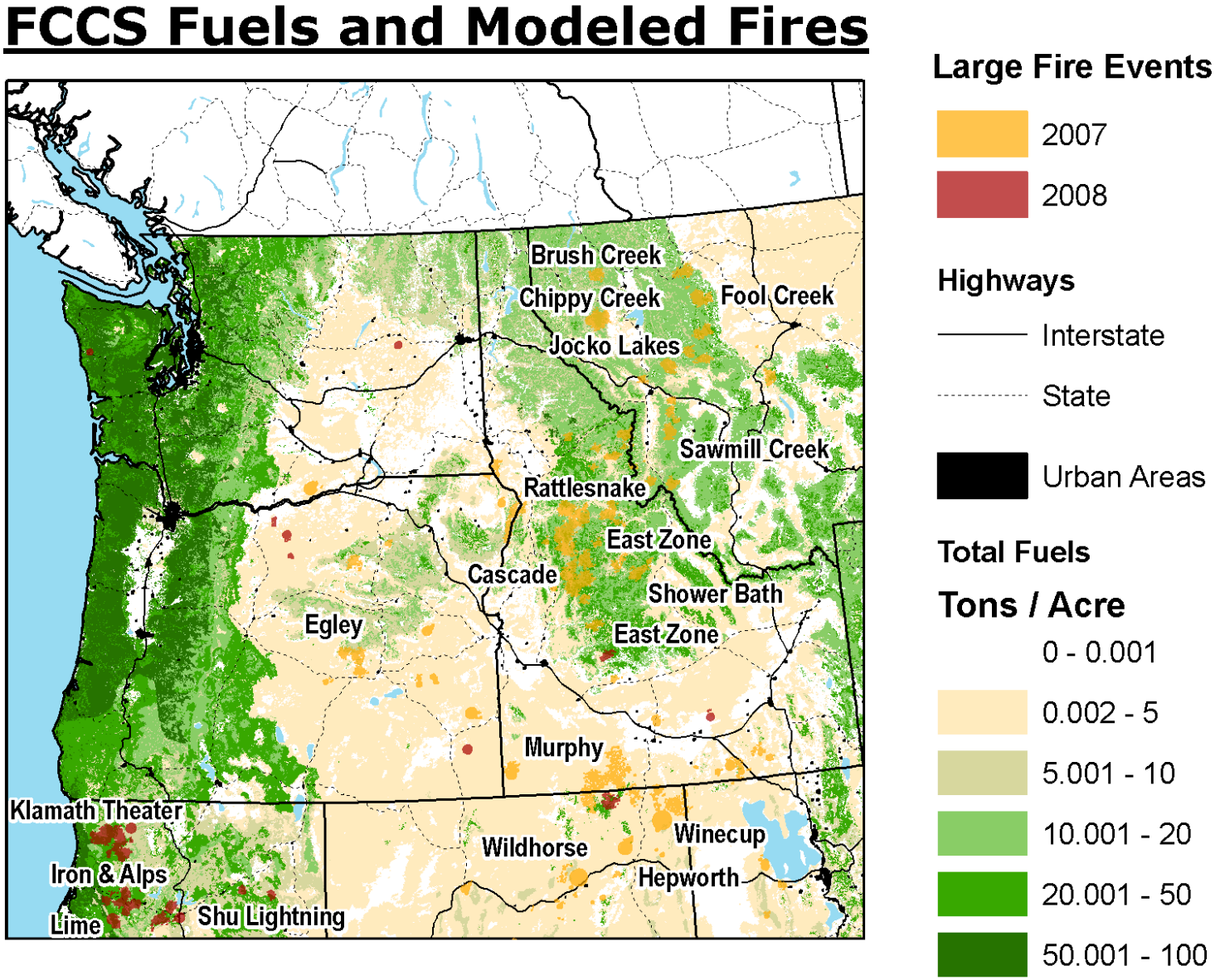

Fig. S2: Sites used in the fire analysis.

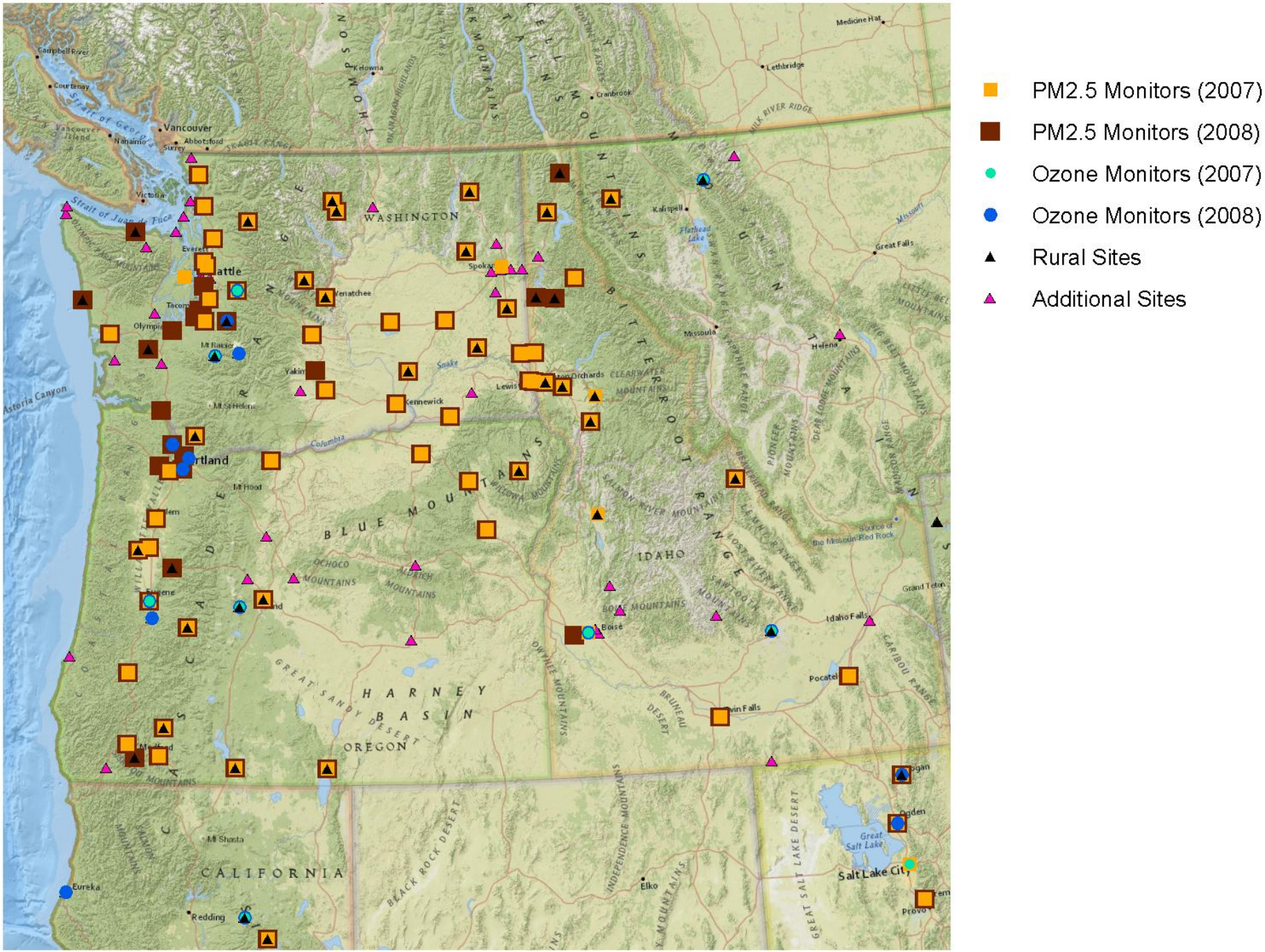

Fig. S3: AOD (left), tropospheric NO2 columns (middle), and total carbon monoxide columns (right) for July 22, 2007 with NASA EOS retrieval (top), AIRPACT-3 with FEPS plume rise (middle), and differences (bottom). Grey color indicates no or low-quality data from the satellite retrieval and was not used in the analysis. Values greater than the color scale maximum are shown as pink in the AIRPACT-3 and NASA EOS maps. Values outside the extent of the difference color scales are shown as darkened blue/red.

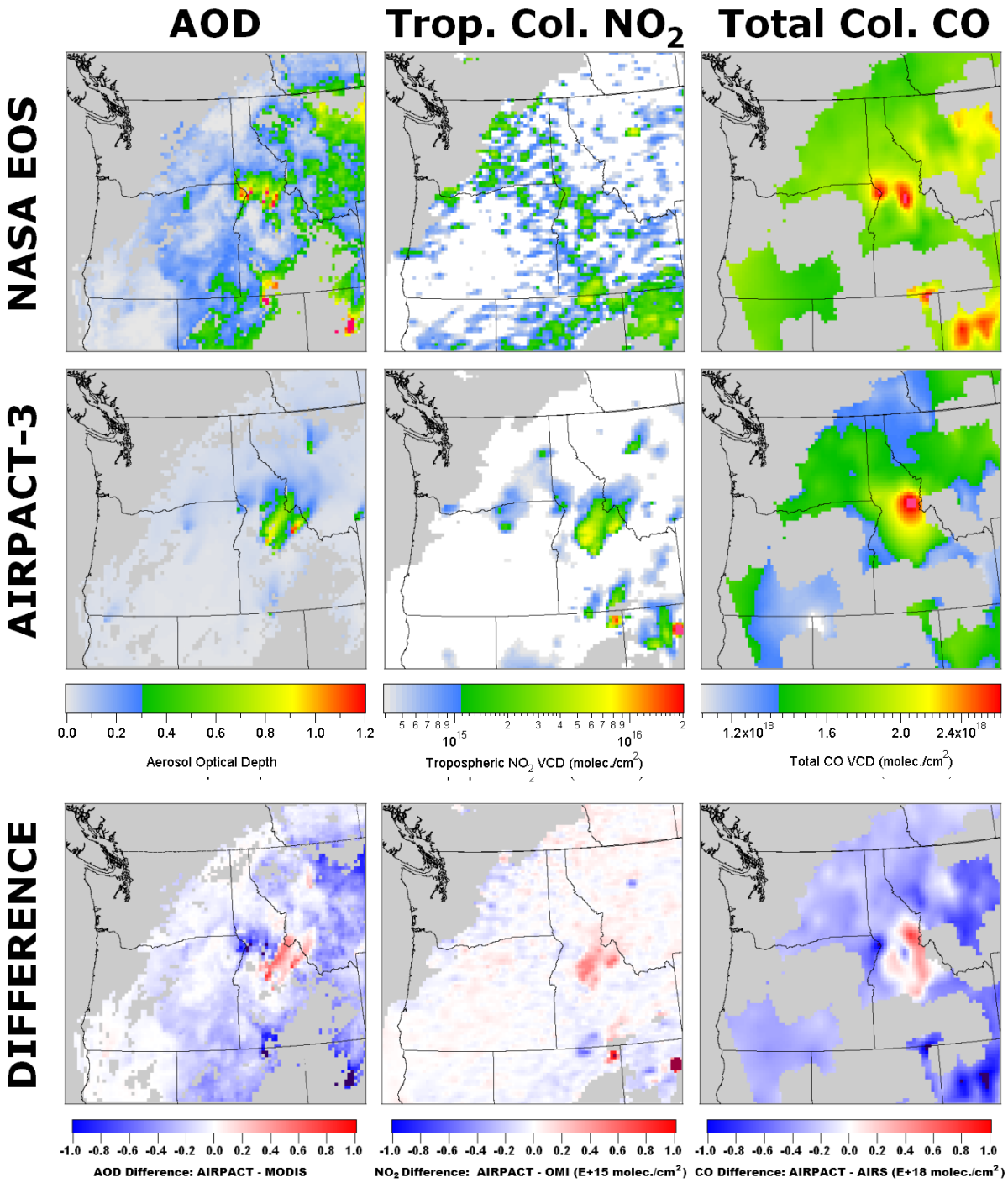

Fig. S4: AOD (left), tropospheric NO2 columns (middle), and total carbon monoxide columns (right) for August 12, 2007 with NASA EOS retrieval (top), AIRPACT-3 with FEPS plume rise (middle), and differences (bottom). Grey color indicates no or low-quality data from the satellite retrieval and was not used in the analysis. Values greater than the color scale maximum are shown as pink in the AIRPACT-3 and NASA EOS maps. Values outside the extent of the difference color scales are shown as darkened blue/red.

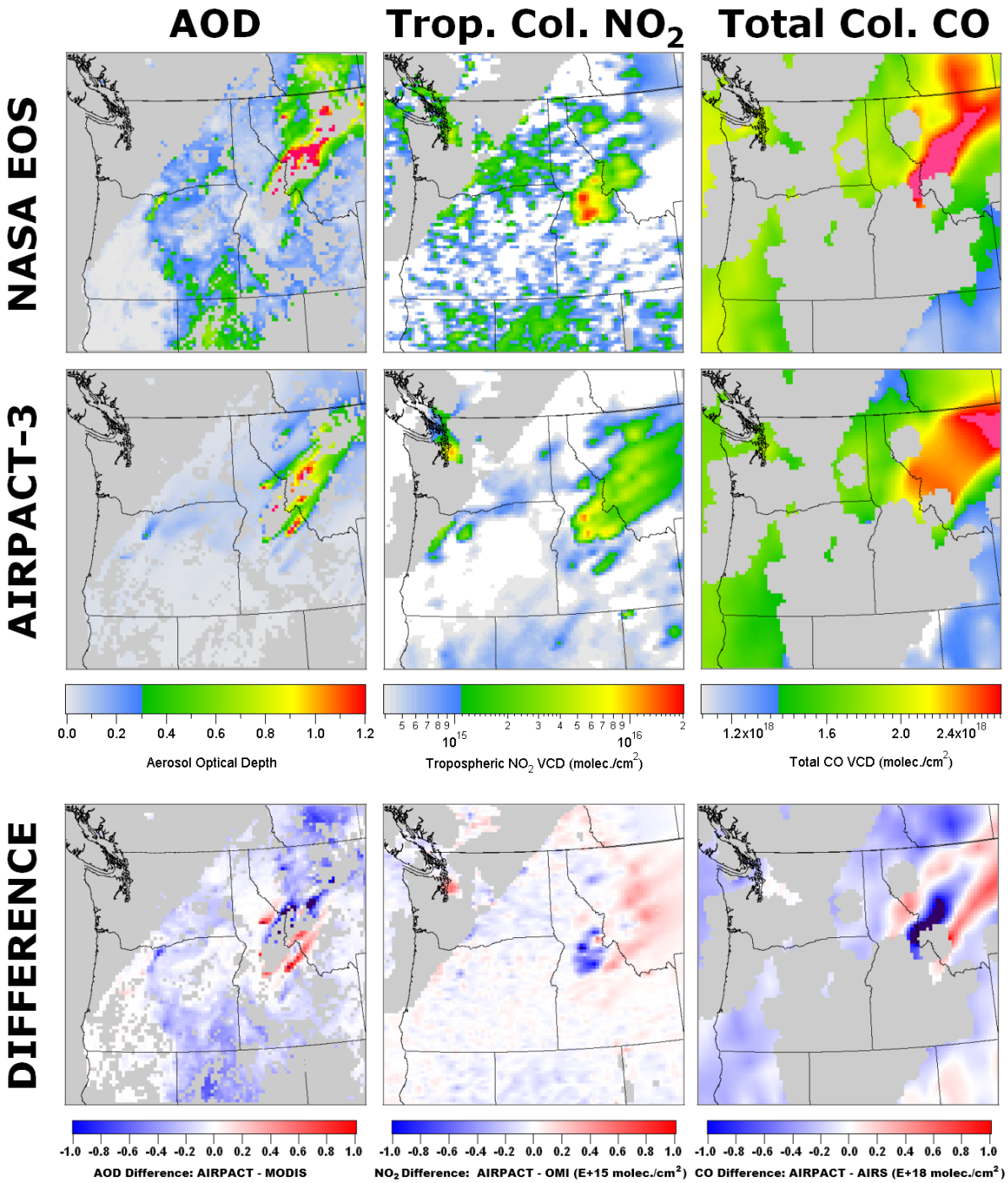

Fig. S5a: AOD (left column), tropospheric NO_2 columns (middle column), and total carbon monoxide columns (right column) for August 18, 2007 (~ 2 p.m. LST) with NASA EOS retrieval (top row), AIRPACT-3 with SMOKE plume rise (middle row), and differences (bottom row). Grey color indicates no or low-quality data from the satellite retrieval and exclusion from analysis. Values greater than the color scale maximum are shown as pink in the AIRPACT-3 and NASA EOS maps. Values outside the range of the difference color scales are shown as saturated blue/red.

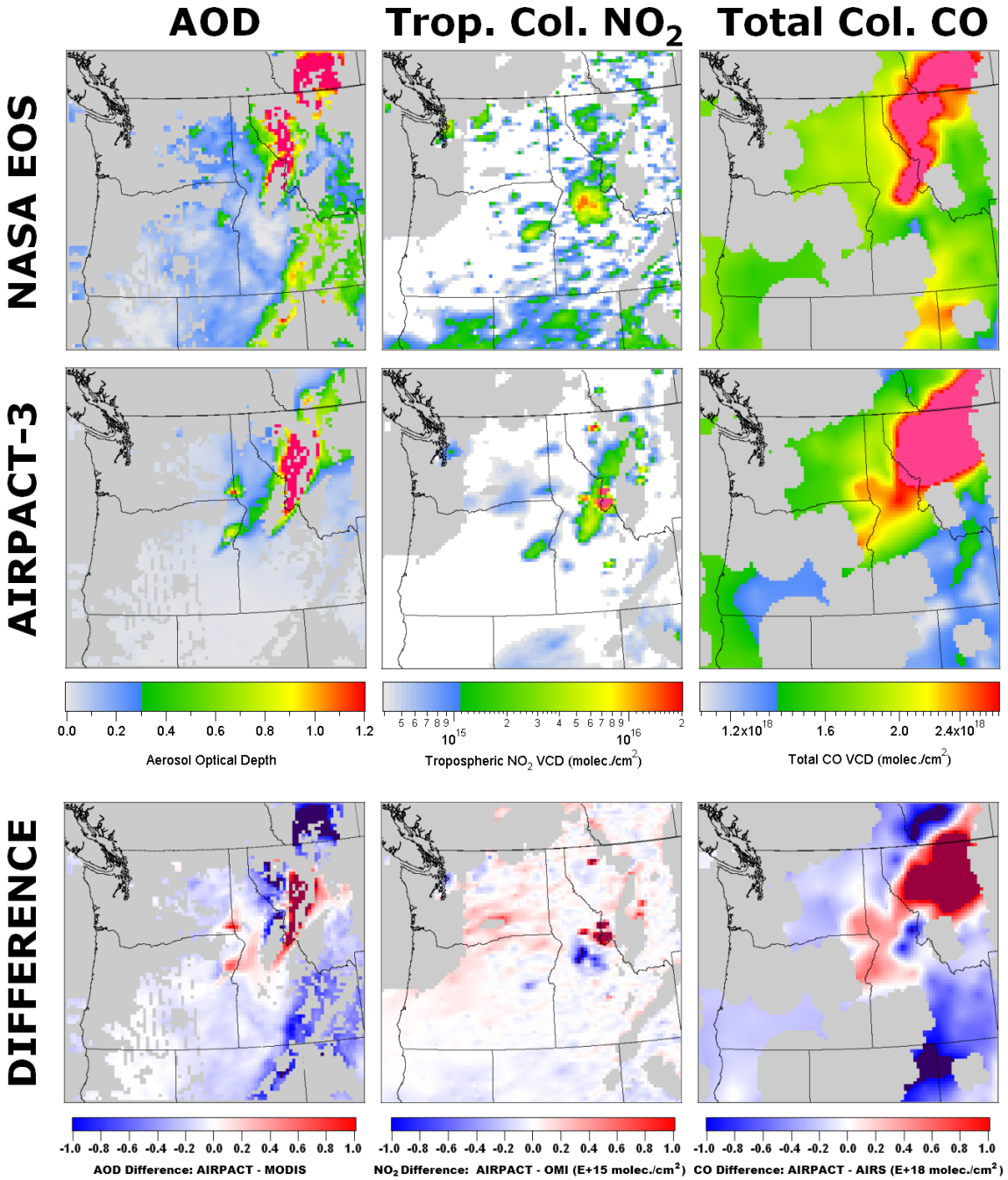

Fig. S5b: AOD (left), tropospheric NO2 columns (middle), and total carbon monoxide columns (right) for August 18, 2007 with NASA EOS retrieval (top), AIRPACT-3 with FEPS plume rise (middle), and differences (bottom). Grey color indicates no or low-quality data from the satellite retrieval and was not used in the analysis. Values greater than the color scale maximum are shown as pink in the AIRPACT-3 and NASA EOS maps. Values outside the extent of the difference color scales are shown as darkened blue/red.

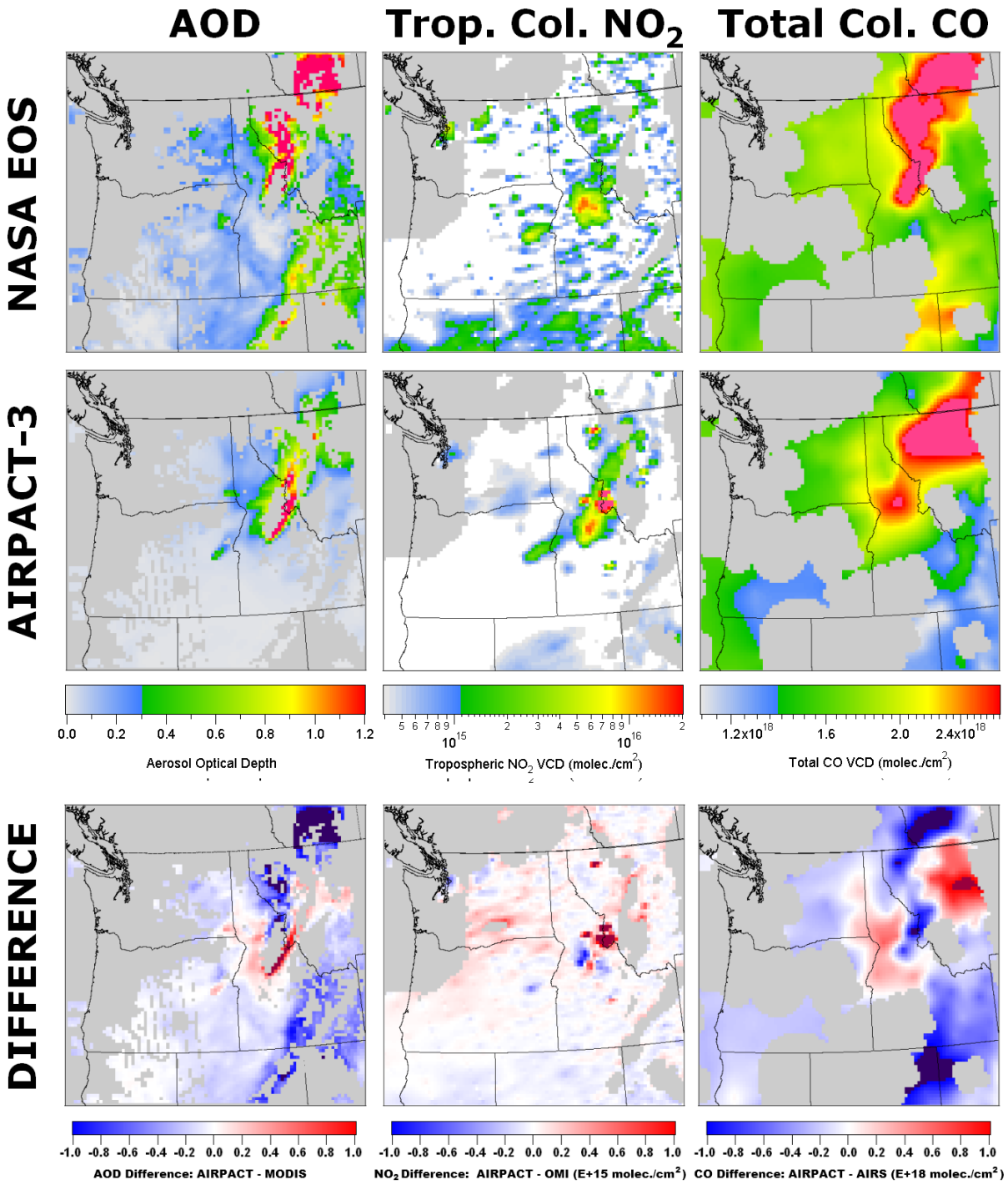

Fig. S6: AOD (left), tropospheric NO2 columns (middle), and total carbon monoxide columns (right) for June 29, 2008 with NASA EOS retrieval (top), AIRPACT-3 with FEPS plume rise (middle), and differences (bottom). Grey color indicates no or low-quality data from the satellite retrieval and was not used in the analysis. Values greater than the color scale maximum are shown as pink in the AIRPACT-3 and NASA EOS maps. Values outside the extent of the difference color scales are shown as darkened blue/red.

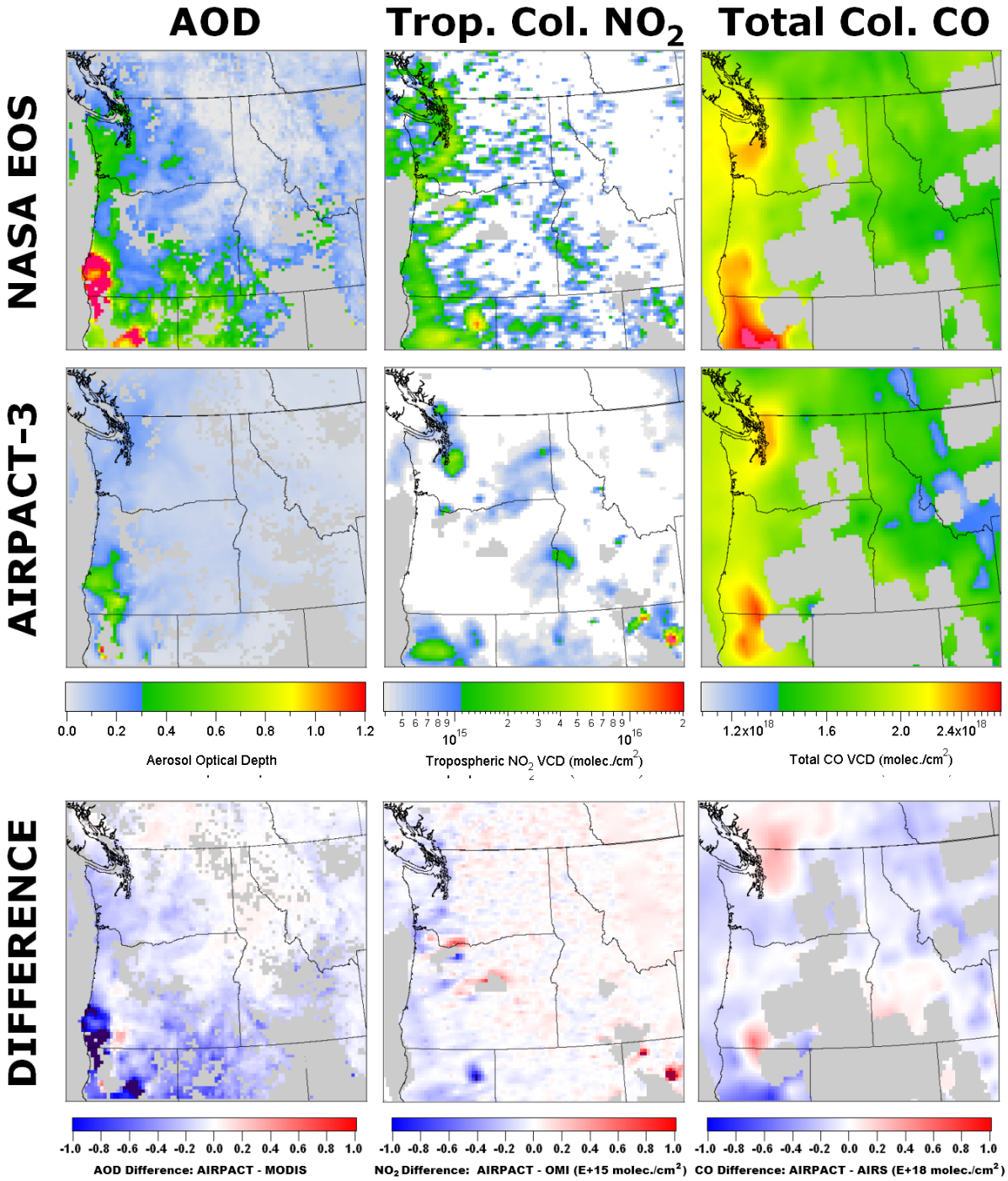

Fig. S7a: AOD (left column), tropospheric NO_2 columns (middle column), and total carbon monoxide columns (right column) for July 11, 2008 (~ 2 p.m. LST) with NASA EOS retrieval (top row), AIRPACT-3 with SMOKE plume rise (middle row), and differences (bottom row). Grey color indicates no or low-quality data from the satellite retrieval and excluded from analysis. Values greater than the color scale maximum are shown as pink in the AIRPACT-3 and NASA EOS maps. Values outside the range of the difference color scales are shown as saturated blue/red.

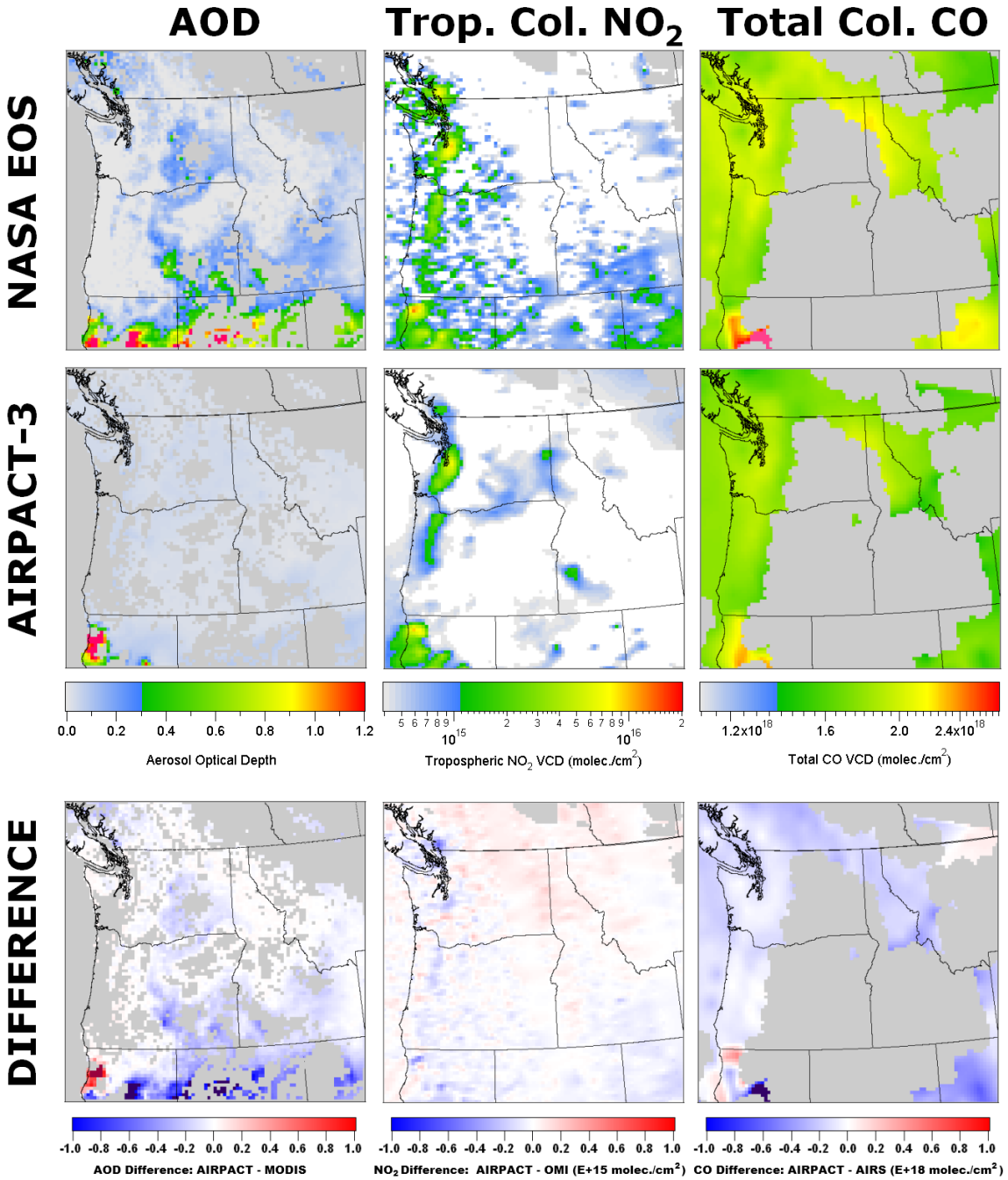

Fig. S7b: AOD (left), tropospheric NO2 columns (middle), and total carbon monoxide columns (right) for July 11, 2008 with NASA EOS retrieval (top), AIRPACT-3 with FEPS plume rise (middle), and differences (bottom). Grey color indicates no or low-quality data from the satellite retrieval and was not used in the analysis. Values greater than the color scale maximum are shown as pink in the AIRPACT-3 and NASA EOS maps. Values outside the extent of the difference color scales are shown as darkened blue/red.

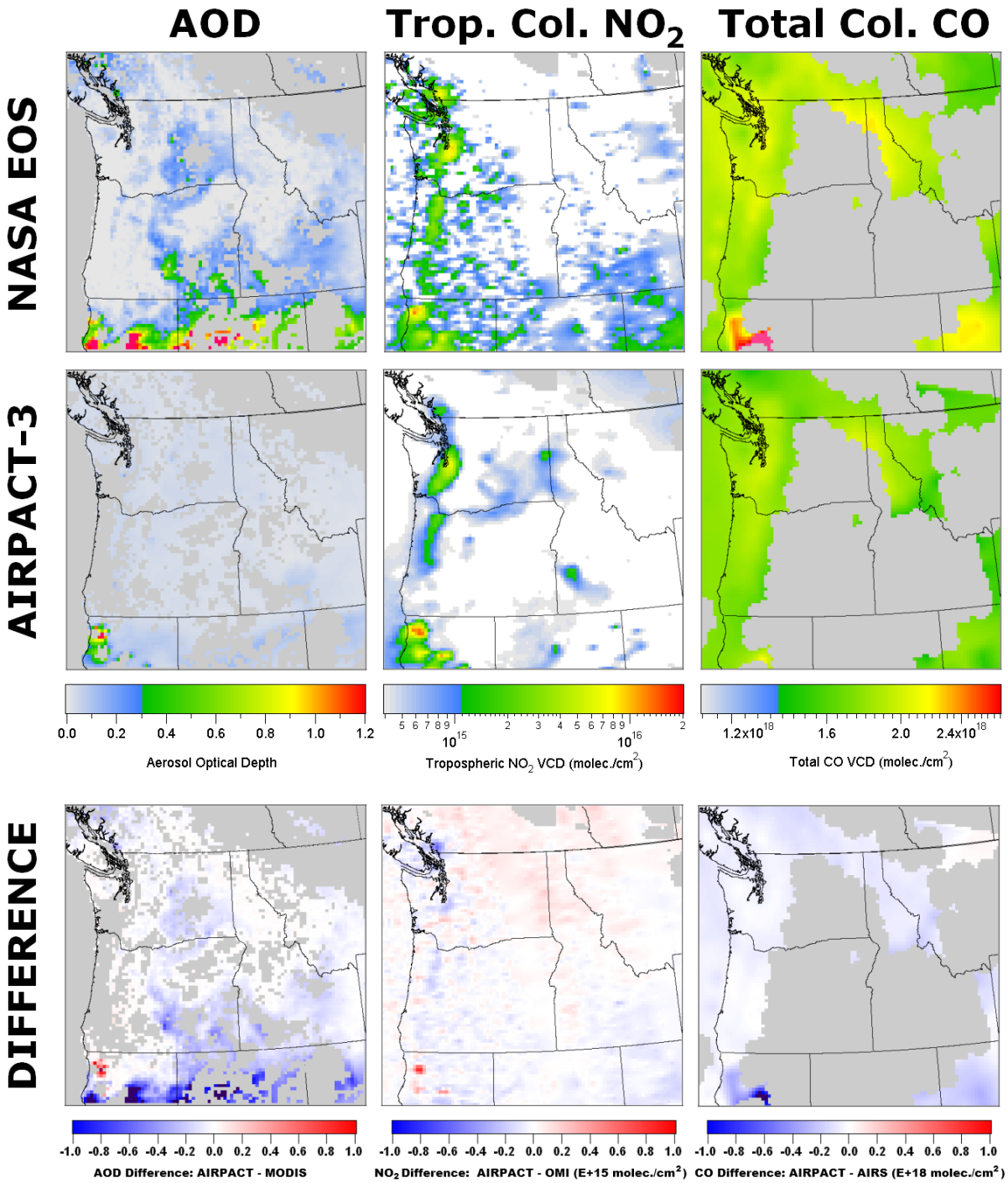

Fig. S8: AOD (left), tropospheric NO2 columns (middle), and total carbon monoxide columns (right) for July 20, 2008 with NASA EOS retrieval (top), AIRPACT-3 with FEPS plume rise (middle), and differences (bottom). Grey color indicates no or low-quality data from the satellite retrieval and was not used in the analysis. Values greater than the color scale maximum are shown as pink in the AIRPACT-3 and NASA EOS maps. Values outside the extent of the difference color scales are shown as darkened blue/red.

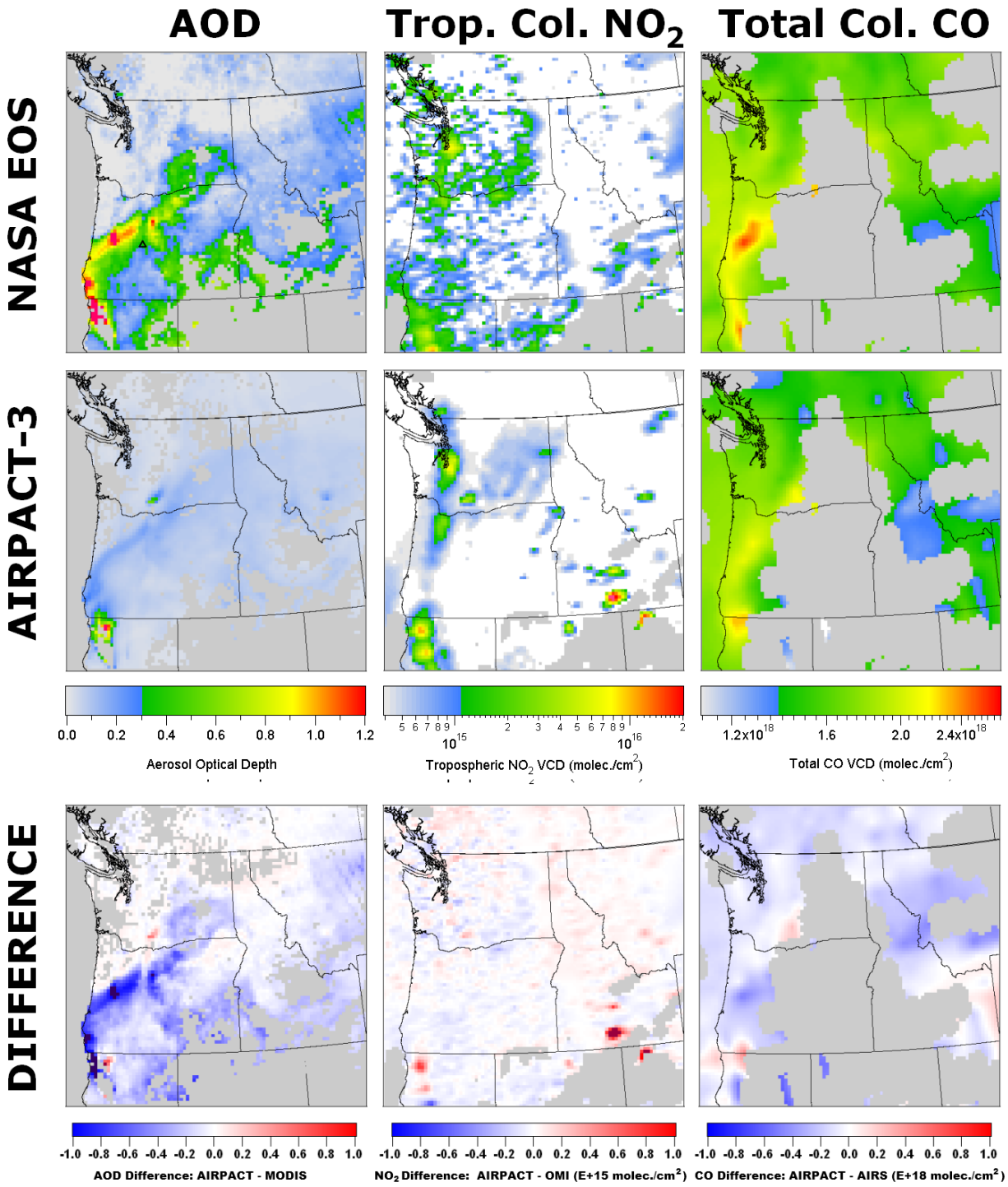

Fig. S9: Predicted only, observed only, and matched 24-hr PM2.5 NAAQS (35 μg/m^3) exceedances for July 3 to August 22, 2007 (FEPS plume rise scenario). Sites with no exceedances are shown as white asterisks.

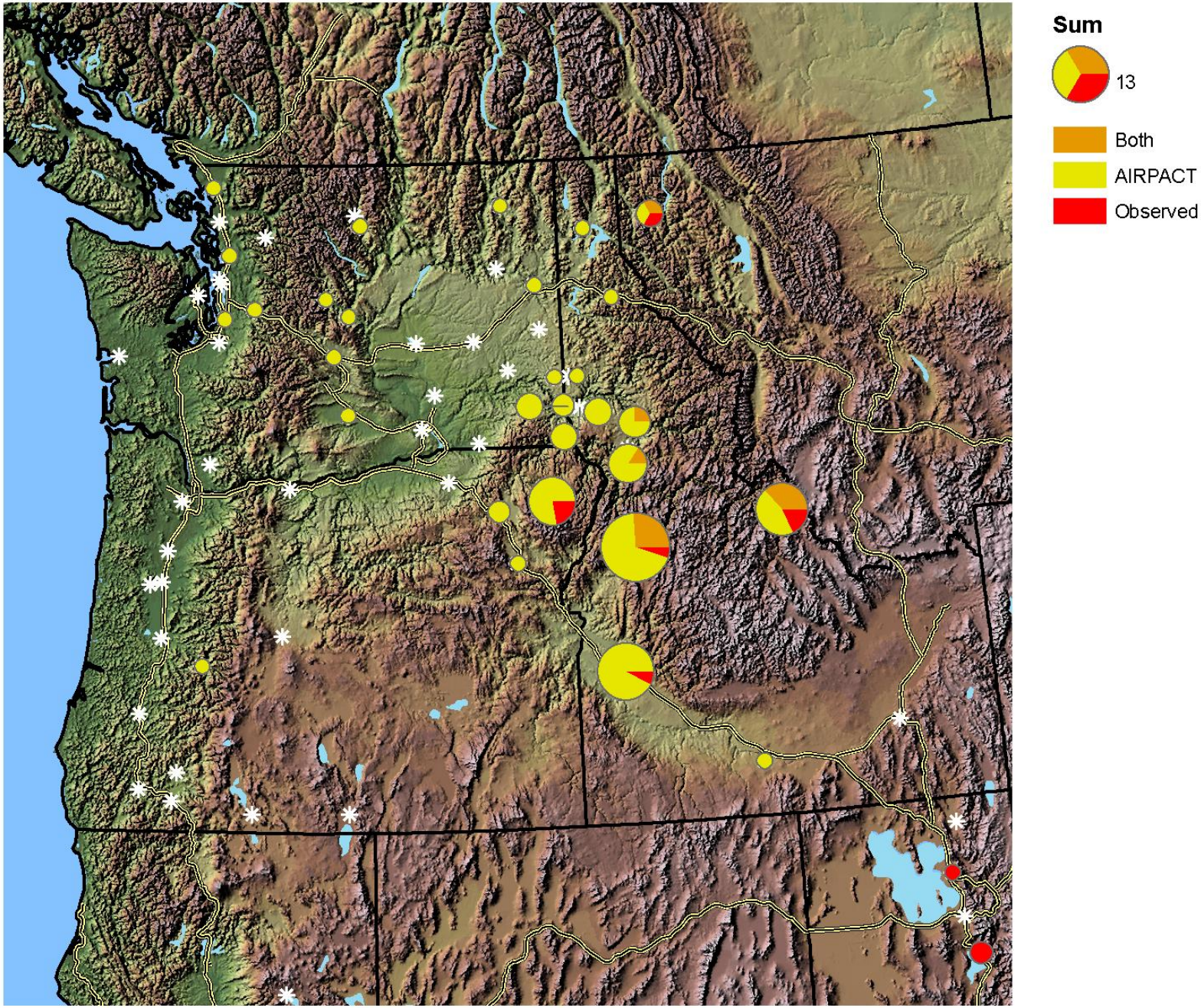

Fig. S10: Predicted only, observed only, and matched 24-hr PM2.5 NAAQS (35 μg/m^3) exceedances for June 22 to Aug. 27, 2008 (FEPS plume rise scenario). Sites with no exceedances are shown as white asterisks.

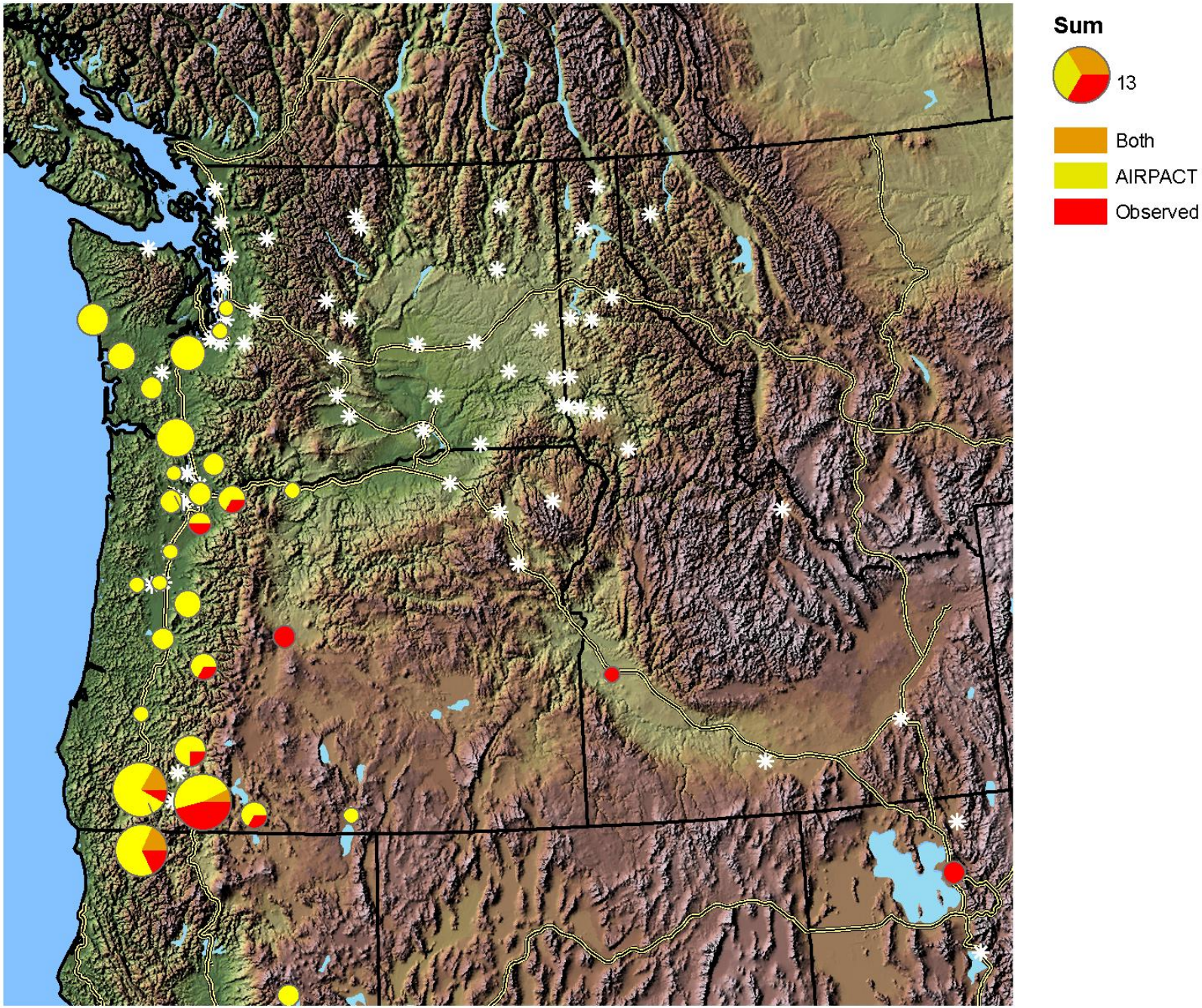
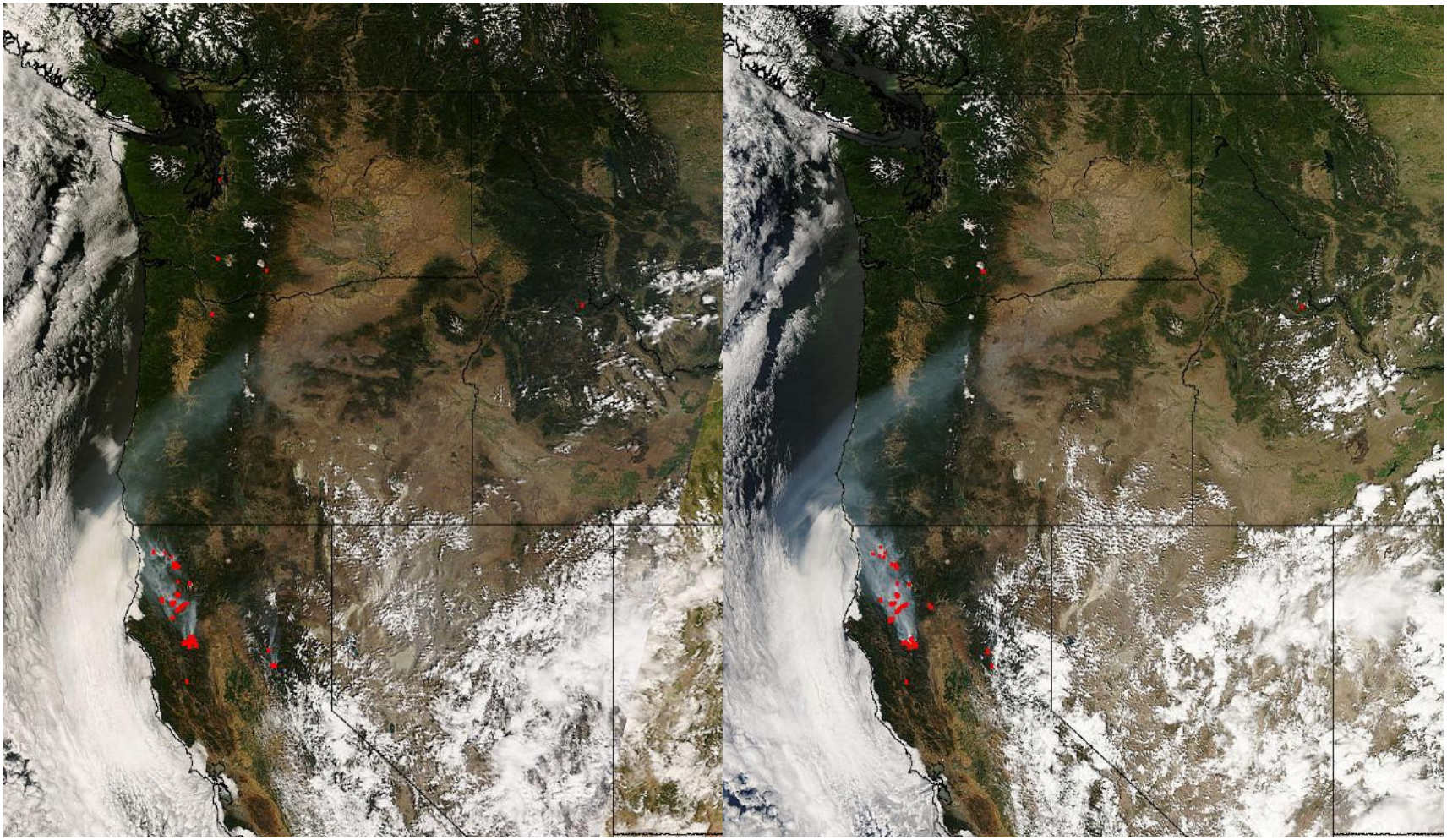
Fig. S11: MODIS true-color imagery from Terra (left) and Aqua (right) on July20, 2008.