

Supplementary Materials for
**Attribution of individual methane and carbon dioxide emission sources using
EMIT observations from space**

Andrew K. Thorpe *et al.*

Corresponding author: Andrew K. Thorpe, andrew.k.thorpe@jpl.nasa.gov

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This PDF file includes:

Text S1 and S2
Fig. S1
Table S1

Text S1. Spectral fingerprint of methane and carbon dioxide

Methane and carbon dioxide have distinct spectral fingerprints that EMIT can identify, permitting gas retrievals and emission estimates. The spectral fingerprints shown in Fig. S1 were calculated as the ratio of measured radiance within a gas plume divided by radiance outside of the plume. The results for methane (Fig. S1A) and carbon dioxide (Fig. S1B) show excellent agreement with modeled gas transmission (e.g. unit absorption spectra, see Materials and Methods).

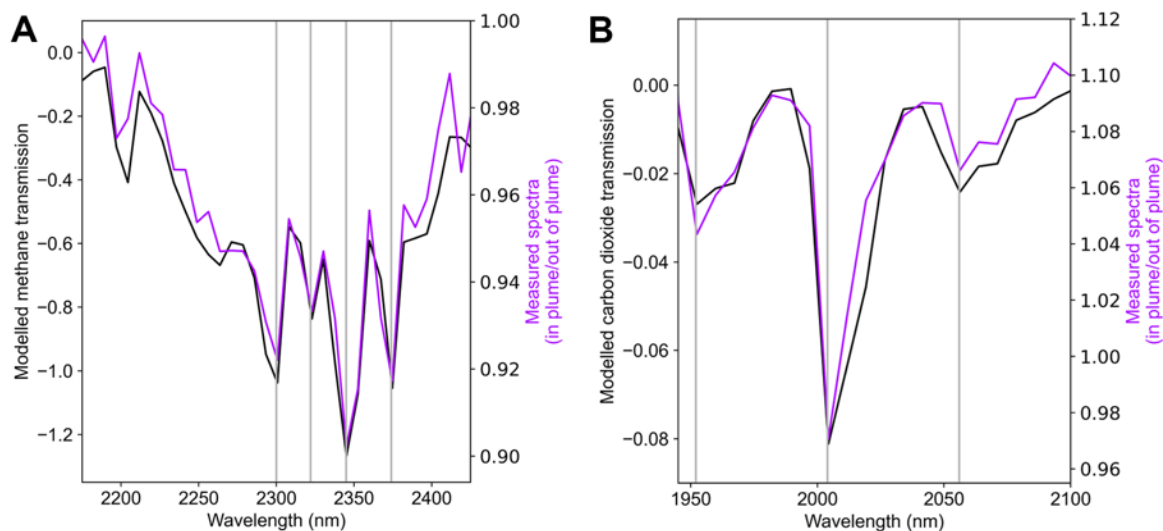


Fig. S1. **Methane and carbon dioxide spectral fingerprints with excellent agreement with modelled gas transmission.** Examples of methane (A) and carbon dioxide (B) spectral fingerprints (purple lines) and modeled gas transmission (black line). The strongest absorption features highlighted by the vertical gray lines.

Supplement 2. Methane and carbon dioxide plume list

The plume examples presented in this study are available through the EMIT applications online mapping tool (<https://earth.jpl.nasa.gov/data/data-portal/Greenhouse-Gases>) with periodic updates reflecting additional observed emissions. A summary of those methane and carbon dioxide plume described in this study are provided in the table below, including the date and time of the EMIT acquisition and the location of the estimated plume origins. EMIT radiance data are available through the Land Processes Distributed Active Archive Center (LP DAAC) at the following link, <https://lpdaac.usgs.gov/products/emitl1bradv001>.

Table S1: Summary of observed plumes

EMIT acquisition	Acquisition date (mm/dd/yyyy)	Acquisition time (UTC)	Estimated plume origin latitude	Estimated plume origin longitude	Gas
emit20220811t042630	08/11/2022	04:26:30	22.323	56.409	Methane
emit20220814t051412	08/14/2022	05:14:12	34.892	41.149	Methane
emit20220814t083654	08/14/2022	08:36:54	47.000	79.982	Methane
emit20220815t042838	08/15/2022	04:28:38	39.469	53.645	Methane
emit20220815t042838	08/15/2022	04:28:38	39.477	53.665	Methane
emit20220815t042838	08/15/2022	04:28:38	39.464	53.777	Methane
emit20220815t042838	08/15/2022	04:28:38	39.447	53.793	Methane
emit20220815t042838	08/15/2022	04:28:38	39.361	53.767	Methane
emit20220815t042838	08/15/2022	04:28:38	39.374	53.831	Methane
emit20220815t042838	08/15/2022	04:28:38	39.347	53.875	Methane
emit20220815t042838	08/15/2022	04:28:38	39.444	53.817	Methane
emit20220815t042838	08/15/2022	04:28:38	39.355	53.877	Methane
emit20220815t042838	08/15/2022	04:28:38	39.378	53.835	Methane
emit20220815t042838	08/15/2022	04:28:38	39.360	53.801	Methane
emit20220815t042838	08/15/2022	04:28:38	39.478	53.734	Methane
emit20220815t043235	08/15/2022	04:32:35	47.692	71.330	Methane
emit20220815t074645	08/15/2022	07:46:45	49.909	72.217	Methane
emit20220815t105833	08/15/2022	10:58:33	39.470	53.645	Methane
emit20220815t105833	08/15/2022	10:58:33	39.476	53.665	Methane
emit20220815t105833	08/15/2022	10:58:33	39.463	53.776	Methane
emit20220815t105833	08/15/2022	10:58:33	39.448	53.793	Methane
emit20220815t105833	08/15/2022	10:58:33	39.361	53.767	Methane
emit20220815t105833	08/15/2022	10:58:33	39.375	53.831	Methane
emit20220815t105833	08/15/2022	10:58:33	39.347	53.875	Methane
emit20220816t034409	08/16/2022	03:44:09	45.996	72.706	Methane
emit20220816t051839	08/16/2022	05:18:39	48.555	58.090	Methane
emit20220816t051839	08/16/2022	05:18:39	48.548	58.057	Methane
emit20220816t101035	08/16/2022	10:10:35	40.421	58.192	Methane
emit20220816t101058	08/16/2022	10:10:58	39.681	60.206	Methane
emit20220816t101058	08/16/2022	10:10:58	39.675	60.196	Methane
emit20220816t101058	08/16/2022	10:10:58	39.668	60.204	Methane
emit20220816t101058	08/16/2022	10:10:58	39.659	60.183	Methane
emit20220816t101158	08/16/2022	10:11:58	37.098	63.645	Methane
emit20220818t034231	08/18/2022	03:42:31	46.548	64.666	Methane
emit20220818t083506	08/18/2022	08:35:06	41.633	69.540	Methane
emit20220818t083506	08/18/2022	08:35:06	41.097	69.486	Methane

emit20220819t043116	08/19/2022	04:31:16	51.118	66.358	Methane
emit20220819t092231	08/19/2022	09:22:31	36.232	59.982	Methane
emit20220820t083324	08/20/2022	08:33:24	39.746	60.289	Methane
emit20220820t083324	08/20/2022	08:33:24	39.482	60.747	Methane
emit20220820t083324	08/20/2022	08:33:24	39.946	61.005	Methane
emit20220820t083324	08/20/2022	08:33:24	40.047	61.045	Methane
emit20220820t083411	08/20/2022	08:34:11	37.581	63.571	Methane
emit20220822t065713	08/22/2022	06:57:13	41.633	69.540	Methane
emit20220823t074504	08/23/2022	07:45:04	36.210	61.521	Methane
emit20220823t074504	08/23/2022	07:45:04	35.978	61.915	Methane
emit20220823t074504	08/23/2022	07:45:04	36.207	61.578	Methane
emit20220823t074504	08/23/2022	07:45:04	35.837	61.946	Methane
emit20220823t074504	08/23/2022	07:45:04	36.005	61.676	Methane
emit20220823t074515	08/23/2022	07:45:15	35.247	62.270	Methane
emit20220823t091950	08/23/2022	09:19:50	30.529	44.553	Methane
emit20220826t065435	08/26/2022	06:54:35	37.924	53.900	Methane
emit20220826t065435	08/26/2022	06:54:35	37.903	53.890	Methane
emit20220826t065435	08/26/2022	06:54:35	37.749	53.934	Methane
emit20220826t065435	08/26/2022	06:54:35	37.891	53.908	Methane
emit20220826t082915	08/26/2022	08:29:15	33.331	36.444	Methane
emit20220827t060619	08/27/2022	06:06:19	39.538	56.138	Methane
emit20220827t060619	08/27/2022	06:06:19	40.109	56.273	Methane
emit20220827t060642	08/27/2022	06:06:42	39.521	57.582	Methane
emit20220827t060642	08/27/2022	06:06:42	39.527	57.515	Methane
emit20220827t060642	08/27/2022	06:06:42	39.599	57.352	Methane
emit20220827t060642	08/27/2022	06:06:42	39.158	57.194	Methane
emit20220827t060642	08/27/2022	06:06:42	39.211	57.089	Methane
emit20220827t060654	08/27/2022	06:06:54	38.179	58.356	Methane
emit20220827t060730	08/27/2022	06:07:30	37.341	60.485	Methane
emit20220827t060753	08/27/2022	06:07:53	36.419	61.543	Methane
emit20220827t060753	08/27/2022	06:07:53	36.407	61.559	Methane
emit20220827t060753	08/27/2022	06:07:53	36.379	61.918	Methane
emit20220827t060753	08/27/2022	06:07:53	36.490	61.623	Methane
emit20220827t060753	08/27/2022	06:07:53	36.476	61.623	Methane
emit20220827t060753	08/27/2022	06:07:53	36.575	61.473	Methane
emit20220827t060753	08/27/2022	06:07:53	36.526	61.663	Methane
emit20220827t060753	08/27/2022	06:07:53	36.510	61.660	Methane
emit20220827t060753	08/27/2022	06:07:53	36.502	61.673	Methane
emit20220827t060753	08/27/2022	06:07:53	36.501	61.696	Methane

emit20220827t060753	08/27/2022	06:07:53	36.484	61.632	Methane
emit20220827t060753	08/27/2022	06:07:53	36.478	61.637	Methane
emit20220827t060753	08/27/2022	06:07:53	36.402	61.577	Methane
emit20220827t060753	08/27/2022	06:07:53	36.393	61.566	Methane
emit20220827t060753	08/27/2022	06:07:53	36.372	61.557	Methane
emit20220827t060753	08/27/2022	06:07:53	36.472	61.458	Methane
emit20220827t060753	08/27/2022	06:07:53	36.632	61.641	Methane
emit20220828t051853	08/28/2022	05:18:53	39.974	61.681	Methane
emit20220828t051905	08/28/2022	05:19:05	39.934	62.368	Methane
emit20220828t051905	08/28/2022	05:19:05	40.050	62.598	Methane
emit20220828t051917	08/28/2022	05:19:17	39.136	63.263	Methane
emit20220828t051929	08/28/2022	05:19:29	39.018	64.072	Methane
emit20220828t051929	08/28/2022	05:19:29	39.013	64.094	Methane
emit20220828t051941	08/28/2022	05:19:41	38.733	64.617	Methane
emit20220828t051941	08/28/2022	05:19:41	38.662	64.775	Methane
emit20220828t051941	08/28/2022	05:19:41	38.786	64.637	Methane
emit20220828t051941	08/28/2022	05:19:41	38.787	64.621	Methane
emit20220828t051941	08/28/2022	05:19:41	38.801	64.645	Methane
emit20220828t065300	08/28/2022	06:53:00	36.975	42.814	Methane
emit20220828t065324	08/28/2022	06:53:24	36.187	43.887	Methane
emit20220828t065550	08/28/2022	06:55:50	30.063	51.551	Methane
emit20220829t060627	08/29/2022	06:06:27	35.459	51.327	Methane
emit20220829t060913	08/29/2022	06:09:13	27.390	60.255	Methane
emit20220829t060913	08/29/2022	06:09:13	27.262	60.694	Methane
emit20220830t065244	08/30/2022	06:52:44	33.324	36.443	Methane
emit20220831t060702	08/31/2022	06:07:02	29.049	47.586	Methane
emit20220831t060702	08/31/2022	06:07:02	28.956	47.962	Methane
emit20220831t060702	08/31/2022	06:07:02	29.169	47.924	Methane
emit20220901t034318	09/01/2022	03:43:18	38.561	65.950	Methane
emit20220901t034318	09/01/2022	03:43:18	38.313	66.071	Methane
emit20220901t034318	09/01/2022	03:43:18	38.483	65.990	Methane
emit20220901t034318	09/01/2022	03:43:18	38.497	66.011	Methane
emit20220901t034318	09/01/2022	03:43:18	38.516	66.002	Methane
emit20220901t034318	09/01/2022	03:43:18	38.542	66.004	Methane
emit20220901t034318	09/01/2022	03:43:18	38.536	65.950	Methane
emit20220901t034318	09/01/2022	03:43:18	38.533	65.927	Methane
emit20220901t034318	09/01/2022	03:43:18	38.537	65.890	Methane
emit20220901t034318	09/01/2022	03:43:18	38.521	65.883	Methane
emit20220901t051709	09/01/2022	05:17:09	35.482	45.447	Methane

emit20220901t051720	09/01/2022	05:17:20	35.180	47.010	Methane
emit20220901t051920	09/01/2022	05:19:20	29.740	53.248	Methane
emit20220901t051932	09/01/2022	05:19:32	29.737	53.251	Methane
emit20220901t052019	09/01/2022	05:20:19	27.182	56.078	Methane
emit20220901t052019	09/01/2022	05:20:19	27.114	55.986	Methane
emit20220903t051924	09/03/2022	05:19:24	24.413	47.019	Methane
emit20220903t051924	09/03/2022	05:19:24	24.537	46.894	Methane
emit20220903t051924	09/03/2022	05:19:24	24.609	46.896	Methane
emit20220903t051924	09/03/2022	05:19:24	24.489	46.942	Methane
emit20220815t025827	08/15/2022	02:58:27	44.898	89.042	Carbon dioxide
emit20220815t025827	08/15/2022	02:58:27	44.864	89.009	Carbon dioxide
emit20220903t051924	09/03/2022	05:19:24	24.413	47.012	Carbon dioxide