

Table S1: High precipitation dates with domain averaged parameters such as daily accumulated precipitation (in mm), MODIS Dark Target Deep Blue (DT-DB) merged Aerosol Optical Depth (AOD) and MERRA-2 AOD. The percentage of grid points with finite MODIS derived AOD value inside the domain is also shown.

Year	Month	Day	Precipitation (in mm)	MODIS DT- DB AOD	MERRA-2 AOD	Grids with finite MODIS AOD values inside domain (in %)
2001	7	14	32.8527	NaN	0.225383	0
2001	7	19	35.6275	NaN	0.129522	0
2001	7	28	36.5082	NaN	0.298442	0
2001	8	12	43.7332	0.8485	0.185965	18
2002	7	2	39.0258	NaN	0.71017	0
2002	7	20	35.9443	NaN	0.641708	0
2002	8	10	48.0192	NaN	0.369739	0
2003	7	5	33.2765	NaN	0.195504	0
2003	7	23	47.84	0.355	0.183335	9
2004	6	17	46.1075	0.271	0.120518	18
2004	7	5	46.3363	NaN	0.255433	0
2004	9	13	33.6993	0.288333	0.328729	27
2004	9	21	56.0797	NaN	0.196624	0
2005	7	9	51.1417	0.2565	0.302487	18
2005	8	14	38.1078	NaN	0.507385	0
2005	9	16	58.2242	NaN	0.122642	0
2005	9	24	52.4905	0.5705	0.150208	18
2006	6	3	48.0658	NaN	0.304683	0
2006	7	8	69.1423	NaN	0.726576	0
2006	8	26	47.725	NaN	0.363214	0
2007	7	5	40.9263	0.393143	0.201219	64
2007	7	11	36.0568	NaN	0.231489	0
2007	7	22	38.877	NaN	0.454508	0
2007	8	12	34.3018	NaN	0.259448	0
2008	6	14	69.2418	1.219	0.589199	9
2008	6	27	33.5453	NaN	0.428456	0
2008	8	26	45.7502	NaN	0.450668	0
2008	9	19	83.7933	NaN	0.135286	0
2009	6	27	35.203	1.35586	1.0748	64
2009	7	19	54.583	0.656	0.293096	9
2009	7	26	33.1407	0.9018	0.362039	45
2009	8	12	42.1283	0.2576	0.273451	45
2009	8	17	60.9722	NaN	0.192102	0
2009	8	30	33.759	0.2915	0.20784	36
2009	9	11	33.0377	NaN	0.337989	0
2010	7	5	47.6792	NaN	0.211352	0
2010	7	10	40.9872	2.55	0.727623	18
2010	7	16	52.8365	0.7755	0.216237	18
2010	7	26	33.7122	0.2535	0.117785	18
2010	7	29	49.8763	0.134	0.233702	18
2010	8	22	41.105	NaN	0.236324	0
2010	9	18	32.9807	NaN	0.145106	0
2011	7	14	34.2018	0.949667	0.351616	27

2011	7	19	42.7448	0.416667	0.205497	27
2011	8	15	48.7568	NaN	0.132182	0
2011	8	22	73.4605	0.480143	0.212764	64
2011	9	8	43.868	NaN	0.205697	0
2011	9	14	37.1833	0.498	0.299527	82
2012	7	3	36.2908	NaN	0.513859	0
2012	7	18	45.5977	2.42867	0.690129	55
2012	7	24	42.966	NaN	0.627878	0
2012	8	2	35.0897	NaN	0.552373	0
2012	9	1	35.4943	NaN	0.476696	0
2012	9	17	39.9055	NaN	0.243857	0
2013	6	10	57.8703	1.75529	1.19672	64
2013	6	16	51.92	NaN	0.142739	0
2013	7	19	47.087	NaN	0.410318	0
2013	8	8	36.3623	NaN	0.287923	0
2013	8	26	36.3528	NaN	0.530323	0
2014	6	20	35.4537	1.46078	0.756235	82
2014	7	5	35.6967	NaN	0.410552	0
2014	7	18	37.5417	NaN	0.216757	0
2014	8	3	36.9662	1.3335	0.50279	18
2014	8	13	61.5707	NaN	0.516442	0
2015	6	24	36.1328	0.605	0.364721	45
2015	7	5	77.812	1.6258	0.814888	45
2015	7	15	90.199	NaN	0.405833	0
2015	7	31	42.2708	NaN	0.154531	0
2016	7	1	58.871	NaN	0.426282	0
2016	7	14	39.7328	NaN	0.172155	0
2016	7	25	48.9102	0.463	0.403148	18
2017	7	1	36.6968	0.4645	0.309418	18
2017	7	9	40.1599	NaN	0.557355	0
2017	8	3	46.4867	NaN	0.3832	0
2017	9	20	34.6838	0.281	0.207441	64

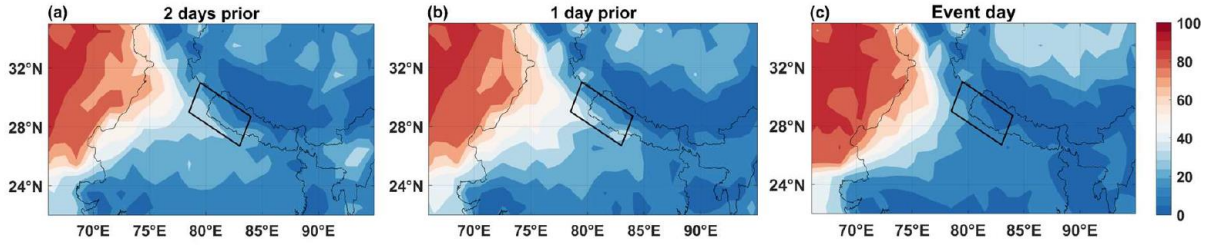


Figure S1. Percentage number of finite MODIS DT-DB AOD values that are averaged to estimate the AOD composite shown in Figure-2 (a-c) of the manuscript at each grid point for (a) two days prior, (b) one day prior and (c) the event day.

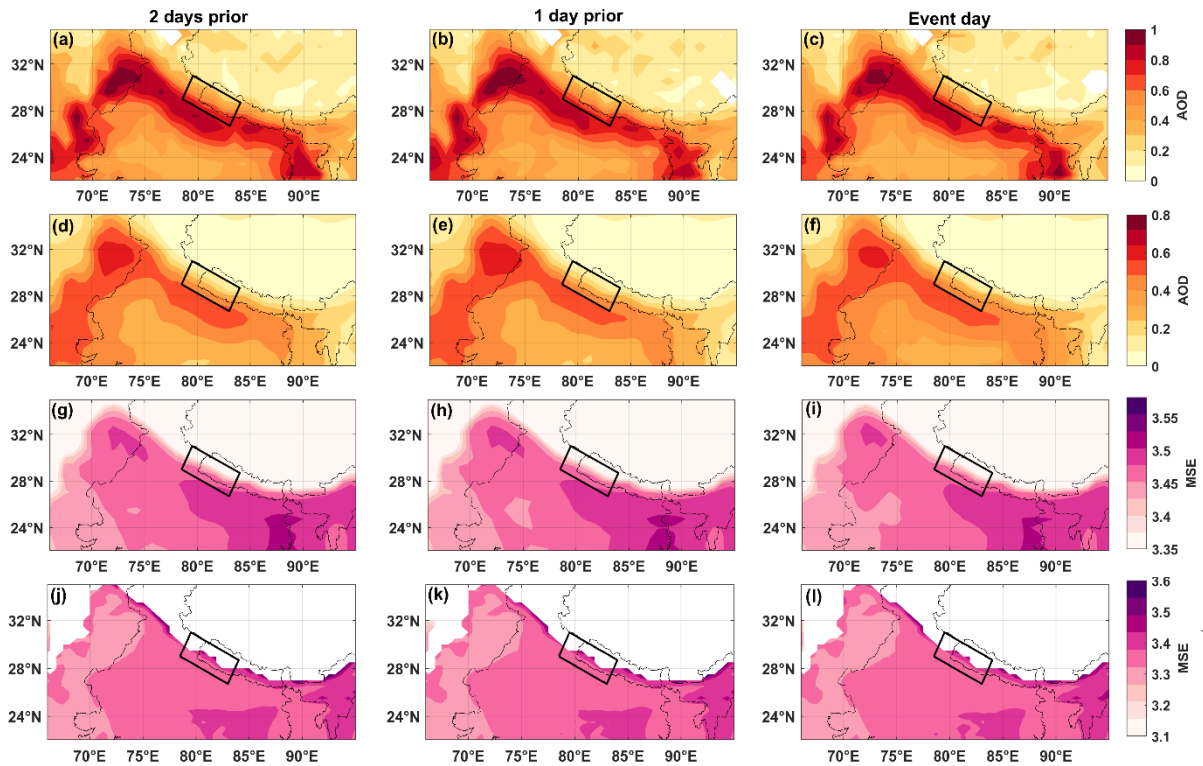


Figure S2. Composites of MODIS AOD (a-c), MERRA-2 AOD (d-f), ERA-Interim lower level MSE (g-i) in units of 10^5 J kg^{-1} and MERRA-2 lower level MSE (j-l) in units of 10^5 J kg^{-1} , for the days with precipitation < 5 percentile (c, f, i, l), one day prior (b, e, h, k) and two days prior (a, d, g, j).

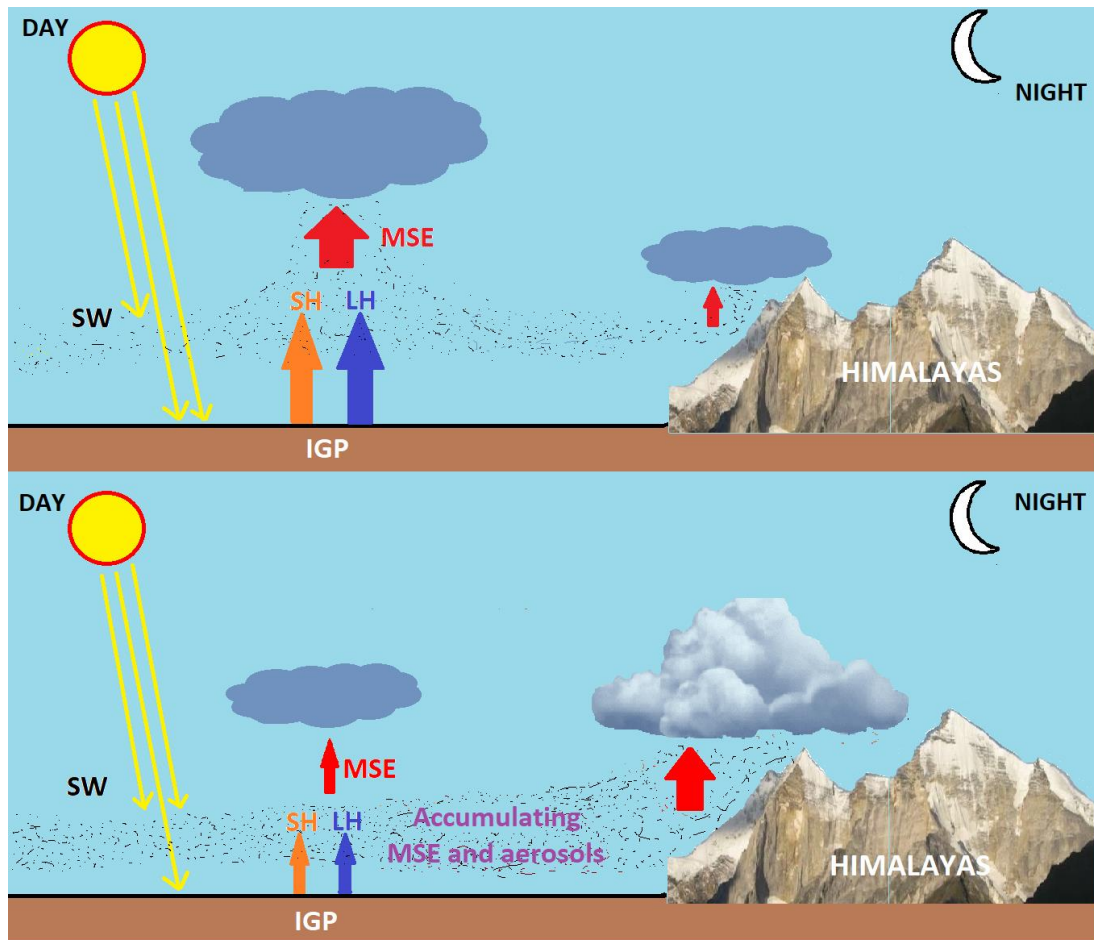


Figure S3. Schematic diagram representing aerosol-enhanced conditional instability over the Himalayan region (after Fan et al., 2015). Top panel represents the clean/low aerosols in the atmosphere with relatively lower moist static energy (MSE) values and bottom panel shows higher amounts of aerosols and accumulated MSE values. In the polluted case, high amounts of MSE build up over the foothills of the Himalaya during daytime due to suppressed convection compared to the clean atmosphere (top panel). The excess MSE in the polluted case is transported towards the Himalayan region by the winds, generating much stronger convection and precipitation over the foothills of the mountain at night. Acronyms: MSE (moist static energy), SW (shortwave radiation), SH (surface sensible heat flux), and LH (surface latent heat flux). The picture of the Himalaya in the right hand bottom corner is showing Gomukh peaks of the mountains (adopted from http://gbpihedervis.nic.in/Glimpses_Himalaya_Photo_gallery.html).