Supporting Information

Atmospheric Chemistry and Physics

Aerosol-meteorology feedback diminishes the trans-boundary transport of black carbon into the Tibetan Plateau

Yuling Hu[a], Shichang Kang[b, c, *], Haipeng Yu[a], Junhua Yang[b], Mukesh Rai[b], Xiufeng Yin[b], Xintong Chen[b], Pengfei Chen[b]

[a]Key Laboratory of Land Surface Process and Climate Change in Cold and Arid Regions, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, Lanzhou 730000, China

[b]State Key Laboratory of Cryospheric Science, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, Lanzhou 730000, China

[c]University of Chinese Academy of Sciences, Beijing 100049, China

Corresponding author: Shichang Kang (shichang.kang@lzb.ac.cn)

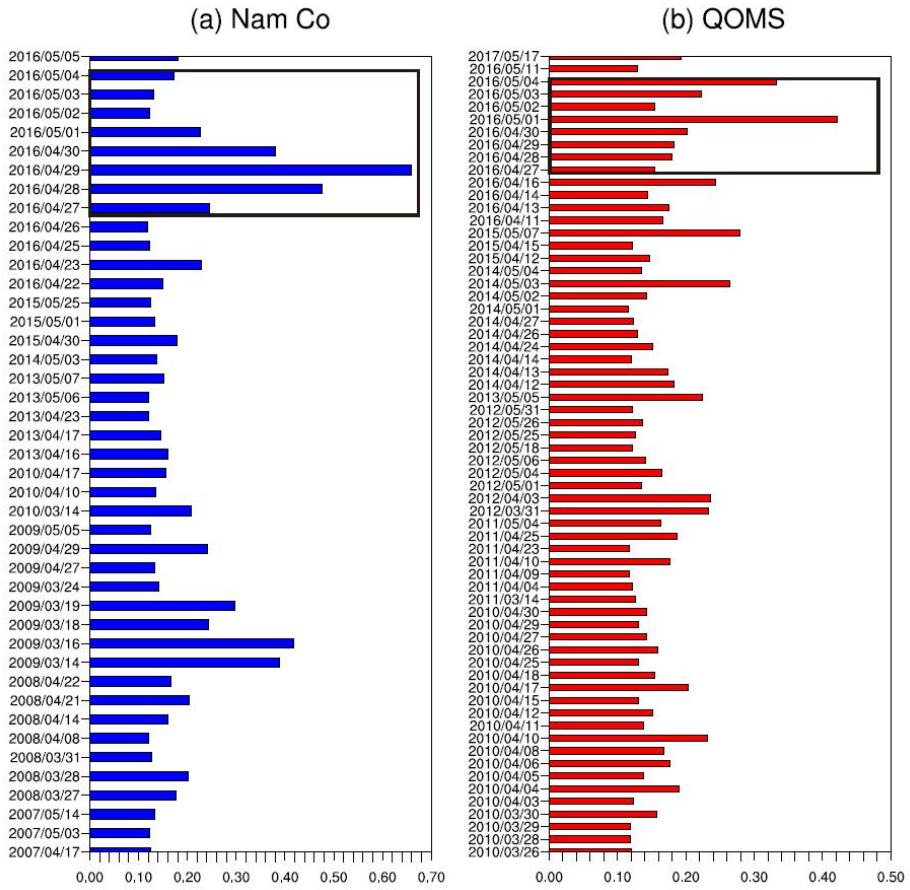

Figure S1 Daily mean of AOD at 500 nm that lies above the 95th percentile at Nam Co (a) and QOMS (b) since 2006 and 2009, respectively.

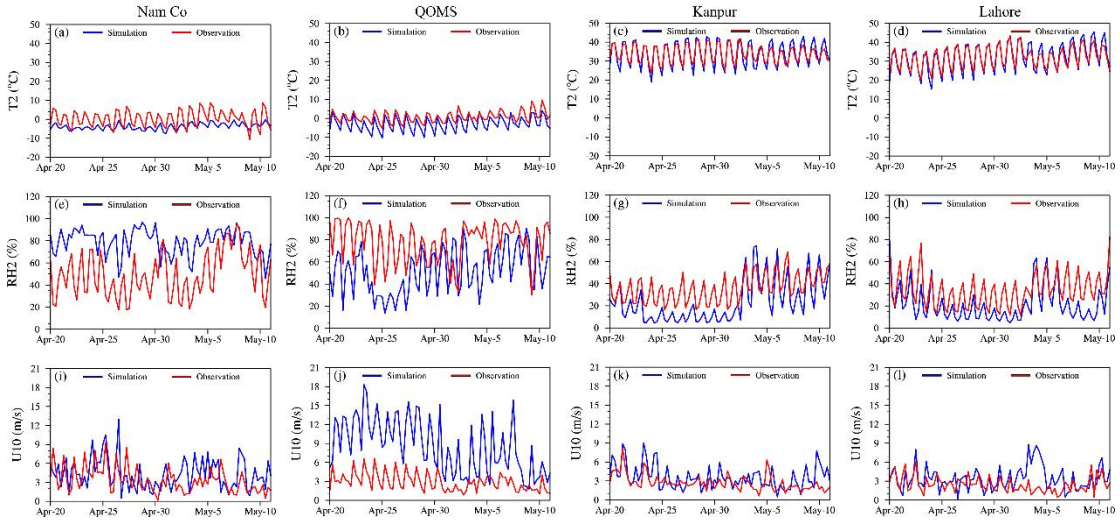

Figure S2 Temporal variations in simulated and reanalyzed daily mean T2 (ºC), RH2 (%), and U10 (m/s) at Nam Co, QOMS, Kanpur, and Lahore stations for the period from April 20 to May 10, 2016.

Table S1 Statistical descriptions of simulated and reanalyzed T2, RH2 and U10 at different stations during the period from April 20 to May 10, 2016.

Variable	Station	N	Simulated mean	Observed mean	MB	NMB (%)	RMSE	R
T2 (ºC)	Nam Co	85	−3.81	0.45	−4.25	−951.27	5.49	0.69**
	QOMS	85	−2.89	0.73	−3.62	−494.11	4.09	0.87**
	Kanpur	85	33.77	33.74	0.03	0.10	2.75	0.94**
	Lahore	85	32.15	32.08	0.07	0.22	2.50	0.96**
RH2 (%)	Nam Co	85	79.02	49.34	29.68	60.15	34.48	0.51**
	QOMS	85	51.55	77.38	−25.82	−33.37	32.20	0.52**
	Kanpur	85	23.63	36.19	−12.56	−34.70	17.10	0.80**
	Lahore	85	21.45	34.45	−13.00	−37.75	16.72	0.78**
U10 (m/s)	Nam Co	85	4.30	3.39	0.91	26.98	2.79	0.30**
	QOMS	85	8.56	2.91	5.66	194.46	6.78	0.55**
	Kanpur	85	3.58	2.73	0.85	31.32	1.91	0.45**
	Lahore	85	3.43	2.47	0.96	38.79	2.20	0.22*

**represents the correlation coefficient exceeding the 99% confidence level, *represents the correlation coefficient exceeding the 95% confidence level.

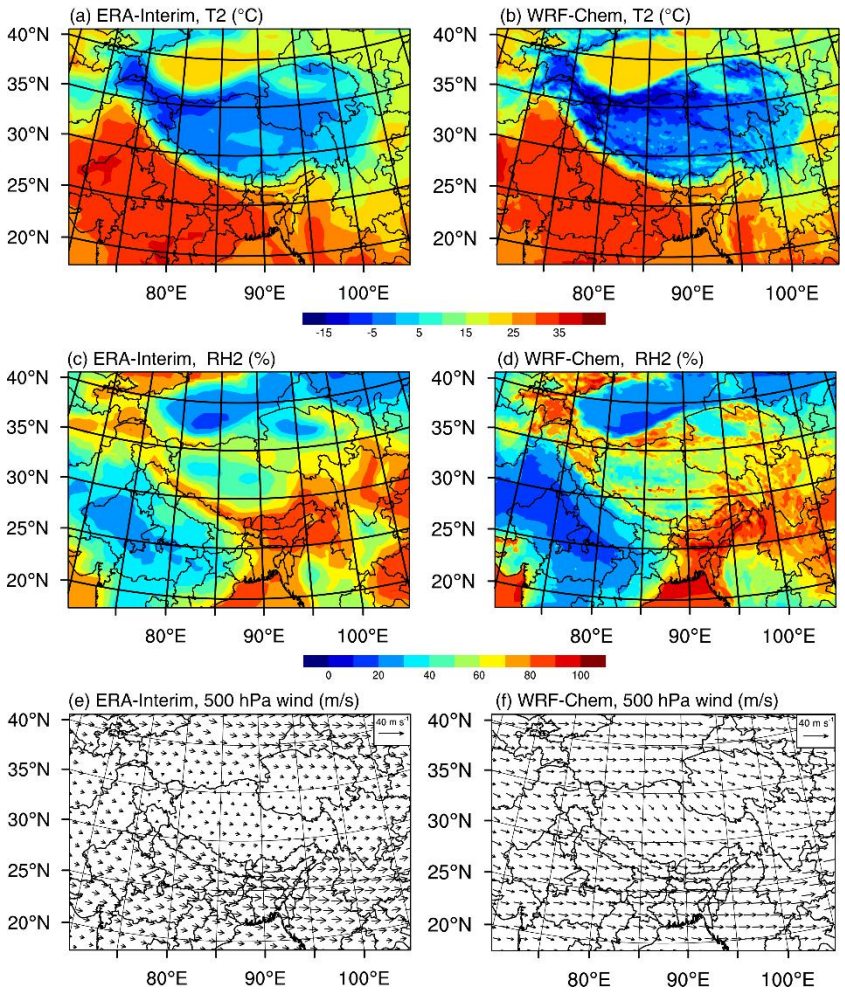

Figure S3 Spatial distributions of simulated and reanalyzed daily mean T2 (ºC), RH2 (%), and wind field (m/s) at 500 hPa averaged for the period from April 20 to May10, 2016.

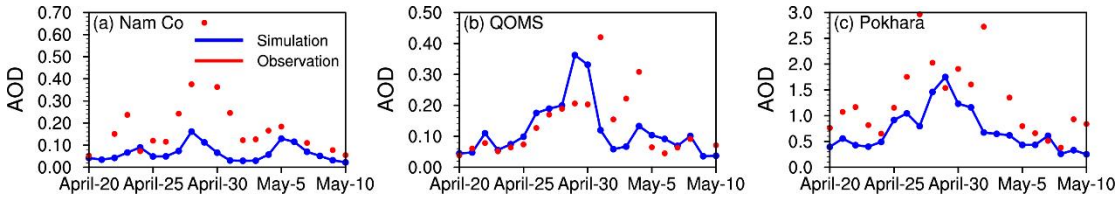

Figure S4 Temporal variations in simulated and observed daily mean AOD at Nam Co (a), QOMS (b), and Pokhara (c) stations for the period from April 20 to May 10, 2016.

Table S2 Statistical descriptions of simulated and observed AOD and BC at different stations during the period from April 20 to May 10, 2016.

Variable	Station	N	Simulated mean	Observed mean	MB	NMB (%)	RMSE	R
AOD	Nam Co	18	0.06	0.19	−0.13	−66.77	0.18	0.58*
	QOMS	20	0.12	0.14	−0.01	−8.57	0.10	0.42
	Pokhara	20	0.71	1.28	−0.57	−44.37	0.80	0.56*
BC	Nam Co	288	0.10	0.17	−0.07	−42.36	0.17	0.67**
	QOMS	288	0.60	0.45	0.14	31.92	0.55	0.43**
	Lhasa	288	0.19	0.22	−0.02	−10.92	0.23	0.47**
	NCO-P	288	0.57	0.58	−0.02	−2.69	0.41	0.50**
	Laohugou	288	0.10	0.08	0.02	26.47	0.04	0.25**
	Kanpur	288	2.61	1.89	0.72	37.91	1.48	0.61**

**represents the correlation coefficient exceeding the 99% confidence level, *represents the correlation coefficient exceeding the 95% confidence level.

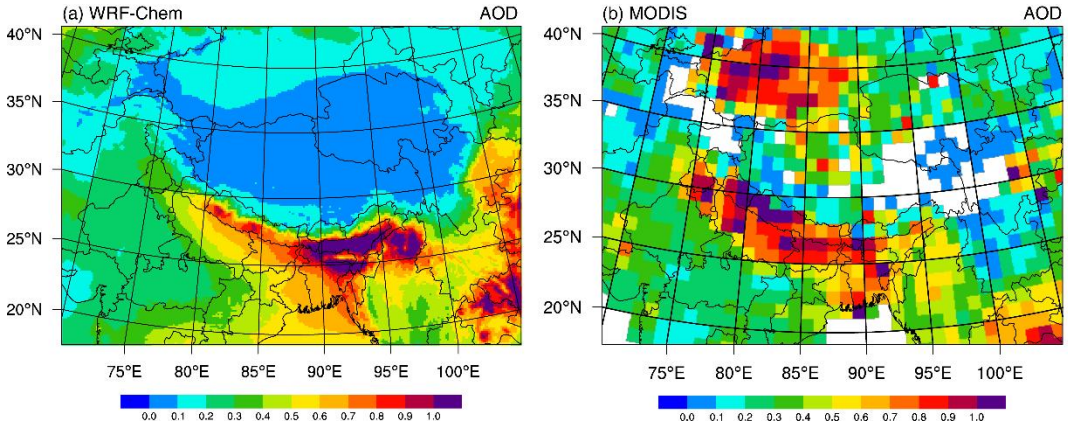

Figure S5 Spatial distributions of simulated and observed daily mean AOD over the domain averaged for the period from April 20 to May 10, 2016.

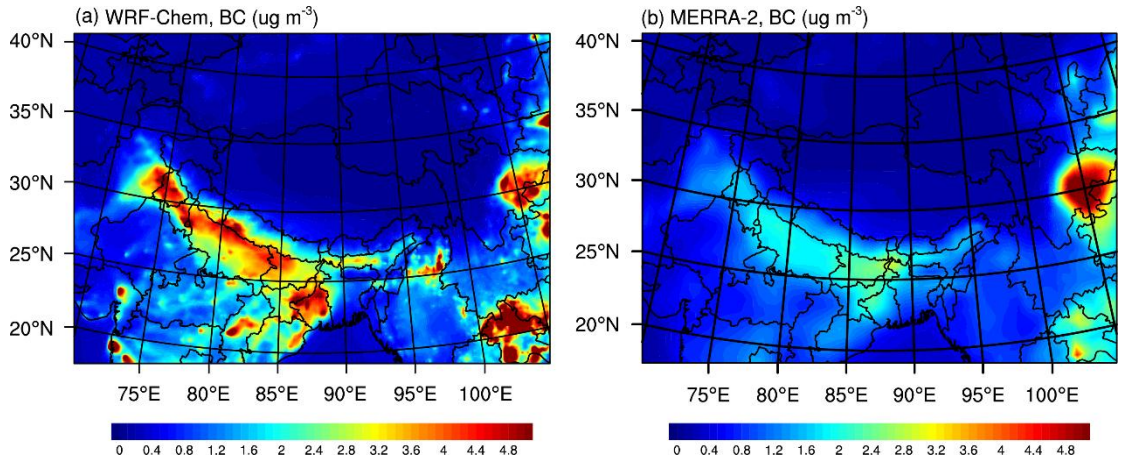

Figure S6 Spatial distributions of simulated and reanalyzed daily mean BC concentrations over the domain averaged for the period from April 20 to May 10, 2016.

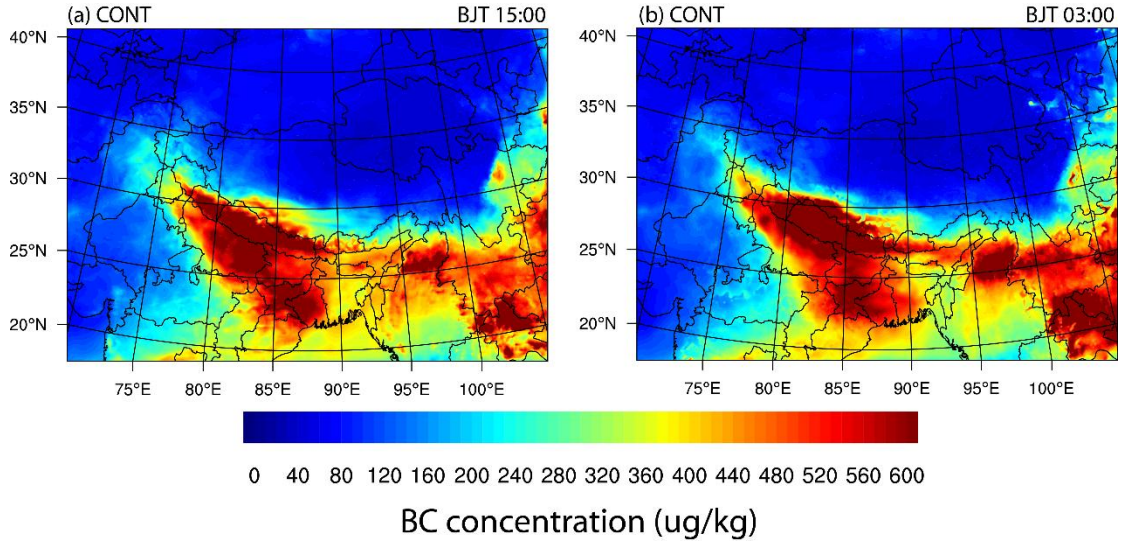

Figure S7 Spatial distribution of integrated BC mass concentration over the study area from the simulation with aerosol-meteorology feedback at 15:00 and 03:00 BJT averaged for the period from April 27 to May 4, 2016.

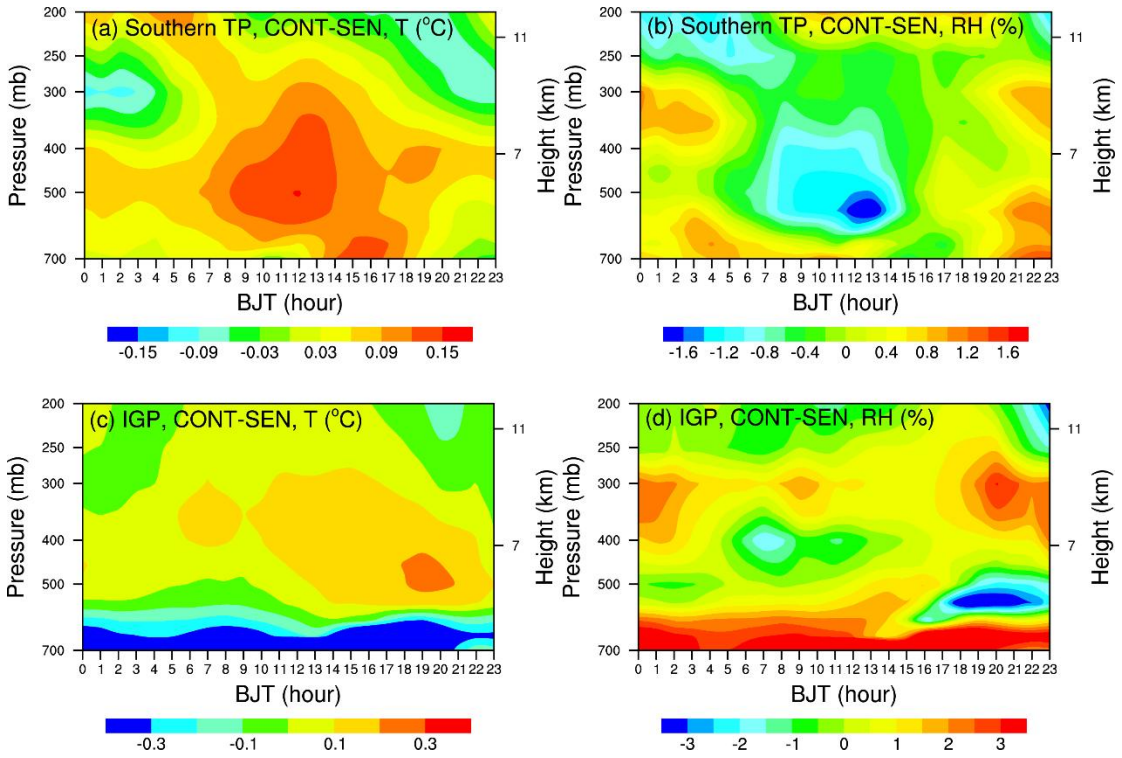

Figure S8 Time–altitude distribution of aerosol-induced diurnal change in (a) temperature (°C) and (b) RH (%) averaged for the southern TP and IGP and the period from April 27 to May 4, 2016.

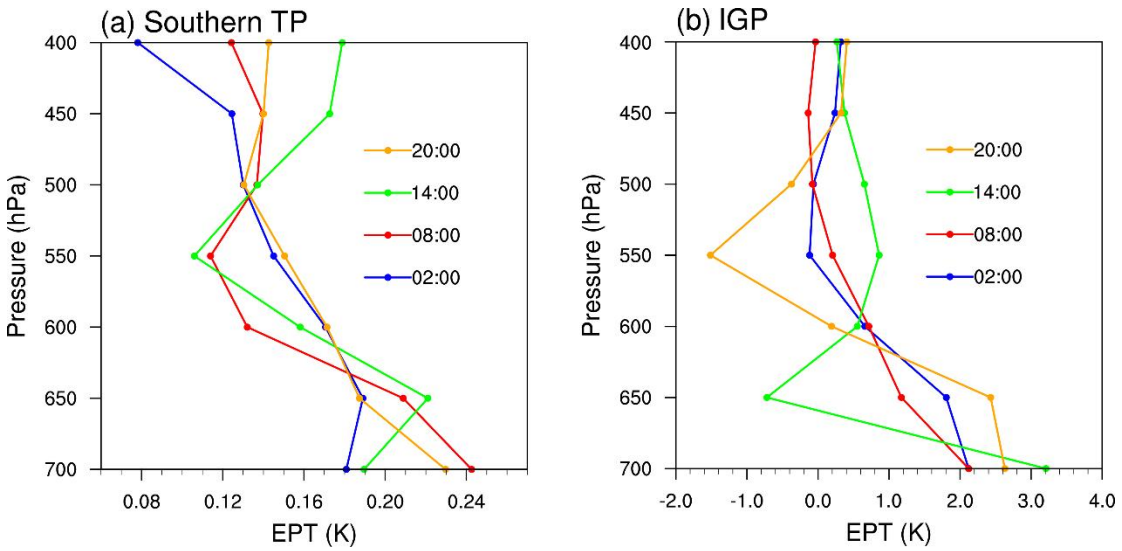

Figure S9 Equivalent potential temperature (EPT, K) profiles at 02:00, 08:00, 14:00, and 20:00 BJT averaged for the (a) Southern TP and (b) IGP and the period from April 27 to May 4, 2016.

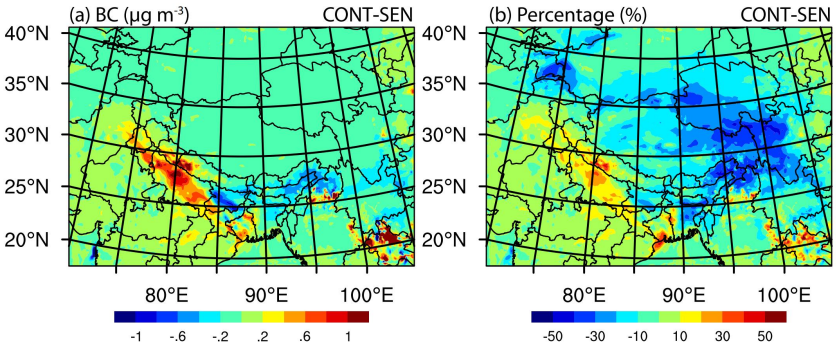

Figure S10 (a) Spatial distribution of changes in surface BC concentration (μg m^{-3}) induced by meteorological variable changes averaged 09:00–20:00 BJT during the period from April 27 to May 4, 2016. (b) The change in percentage terms compared to surface BC concentration from the model results of SEN.

Table S3. The mean zonal and meridional wind speeds at two typical valley channels within 3900 m above the ground at 15:00 and 03:00 BJT averaged for the period from April 27 to May 4, 2016 between the CONT and SEN experiments. The differences in zonal and meridional wind speeds between the two experiments are also shown. Positive value denotes a westerly or a southerly and negative value denotes an easterly or a northerly.

3900 m		15:00		03:00	
		Valley-1	Valley-2	Valley-1	Valley-2
CONT	U component	2.58	−1.80	−0.80	−1.01
	V component	4.49	1.05	−1.46	−1.54
SEN	U component	3.02	−1.33	−0.59	−0.93
	V component	4.73	1.24	−1.37	−1.95
CONT−SEN	U component	−0.44	−0.47	−0.21	−0.08
	V component	−0.24	−0.19	−0.09	0.41