The supporting information is composed of all regional O_3 pollution episodes and the corresponding weather patterns from 2015 to 2019 (Table S1), the typical weather charts (under high pressure and uniform pressure field) during the O_3 pollution episode in this study (Figure S1) and the original plots for USGS_noAH (Figure S2 and 3) and MODIS_withAH (Figure S4 and 5) simulations.

Table S1. Regional O_3 pollution episodes and the corresponding weather patterns in the YRD.

Year	Date	Number of polluted cities	Weather pattern
2015	April 25	13	Under high pressure
	April 26	13	Under high pressure
	May 7	13	Uniform pressure field
	May 25	13	Under high pressure
	June 5	13	Anterior part of high pressure ridge
	June 6	16	Uniform pressure field
	July 2	15	Uniform pressure field
	July 14	15	With typhoon activity
	August 5	14	With typhoon activity
	August 27	13	Uniform pressure field
	August 28	15	Uniform pressure field
	August 29	13	Uniform pressure field
	September 1	14	Uniform pressure field
	September 2	13	Uniform pressure field
	September 3	15	Under high pressure
	September 4	16	Under high pressure
	October 13	15	Under high pressure
	October 14	13	With typhoon activity
	October 15	13	With typhoon activity
	October 16	14	With typhoon activity
2016	April 29	19	Under high pressure
	May 11	13	Under high pressure
	May 12	13	Anterior part of high pressure ridge
	May 17	13	Under high pressure
	May 19	13	Posterior part of high pressure ridge

	June 17	13	Posterior part of high pressure ridge
	July 24	13	Uniform pressure field
	July 25	14	Uniform pressure field
	July 28	16	Uniform pressure field
	July 29	15	Uniform pressure field
	August 19	13	With typhoon activity
	August 25	17	With typhoon activity
	August 28	17	With typhoon activity
	August 31	20	Under high pressure
	September 1	13	With typhoon activity
	September 2	15	With typhoon activity
	September 3	19	With typhoon activity
	September 8	15	Uniform pressure field
	September 9	18	Under high pressure
2017	April 23	16	Under high pressure
	April 24	15	Uniform pressure field
	April 28	19	Anterior part of high pressure ridge
	April 29	21	Under high pressure
	April 30	18	Uniform pressure field
	May 7	14	Under high pressure
	May 10	16	Uniform pressure field
	May 14	18	Under high pressure
	May 17	17	Under high pressure
	May 18	17	Under high pressure
	May 19	14	Uniform pressure field
	May 25	19	Anterior part of high pressure ridge
	May 26	22	Under high pressure
	May 27	22	Under high pressure
	May 28	21	Under high pressure
	May 29	17	Under high pressure
	May 30	18	Uniform pressure field
	May 31	16	Uniform pressure field
	June 1	13	Uniform pressure field
	June 2	18	Under high pressure
	June 3	15	Uniform pressure field

	June 7	16	Anterior part of high pressure ridge
	June 8	22	Under high pressure
	June 9	18	Under high pressure
	June 16	15	Under high pressure
	June 17	14	Uniform pressure field
	July 22	14	With typhoon activity
	July 23	16	With typhoon activity
	July 24	16	With typhoon activity
	July 25	18	With typhoon activity
	July 26	19	With typhoon activity
	July 27	19	With typhoon activity
	August 11	13	Under high pressure
	September 18	20	With typhoon activity
2018	April 1	13	Uniform pressure field
	April 18	15	Under high pressure
	April 19	18	Under high pressure
	April 25	17	Uniform pressure field
	April 26	13	Uniform pressure field
	April 27	22	Under high pressure
	April 28	24	Under high pressure
	April 29	17	Uniform pressure field
	May 4	20	Under high pressure
	May 11	14	Under high pressure
	May 13	13	Uniform pressure field
	May 23	15	Under high pressure
	May 28	13	Uniform pressure field
	June 1	20	Under high pressure
	June 3	13	Uniform pressure field
	June 4	14	Anterior part of high pressure ridge
	June 6	16	With typhoon activity
	June 7	13	With typhoon activity
	June 11	20	With typhoon activity
	June 12	22	Under high pressure
	June 13	18	Uniform pressure field
	June 14	20	Uniform pressure field

	Date	Value	Condition
	June 15	15	With typhoon activity
	July 28	18	With typhoon activity
	August 10	15	With typhoon activity
	August 11	14	With typhoon activity
	September 5	21	Uniform pressure field
	October 7	14	Uniform pressure field
2019	May 9	15	Uniform pressure field
	May 10	17	Uniform pressure field
	May 11	19	Uniform pressure field
	May 12	16	Uniform pressure field
	May 21	13	Anterior part of high pressure ridge
	May 22	17	Uniform pressure field
	May 23	21	Under high pressure
	May 24	14	Under high pressure
	June 2	14	Uniform pressure field
	June 3	14	Uniform pressure field
	June 4	18	Uniform pressure field
	June 5	15	Under high pressure
	June 8	15	Anterior part of high pressure ridge
	June 9	13	Anterior part of high pressure ridge
	June 10	13	Anterior part of high pressure ridge
	June 11	13	Under high pressure
	June 15	22	Under high pressure
	June 16	18	Under high pressure
	June 17	13	Under high pressure
	June 27	13	With typhoon activity
	June 28	16	With typhoon activity
	July 14	15	Under high pressure
	July 15	13	Uniform pressure field
	August 16	18	With typhoon activity
	August 17	17	Uniform pressure field
	August 18	13	Under high pressure
	August 21	16	Uniform pressure field
	September 8	18	With typhoon activity
	September 24	20	Under high pressure

Note. The weather patterns are distinguished by the weather charts at 850 hPa from Korea

Meteorological Administration (http://web.kma.go.kr/chn/weather/images/analysischart.jsp).
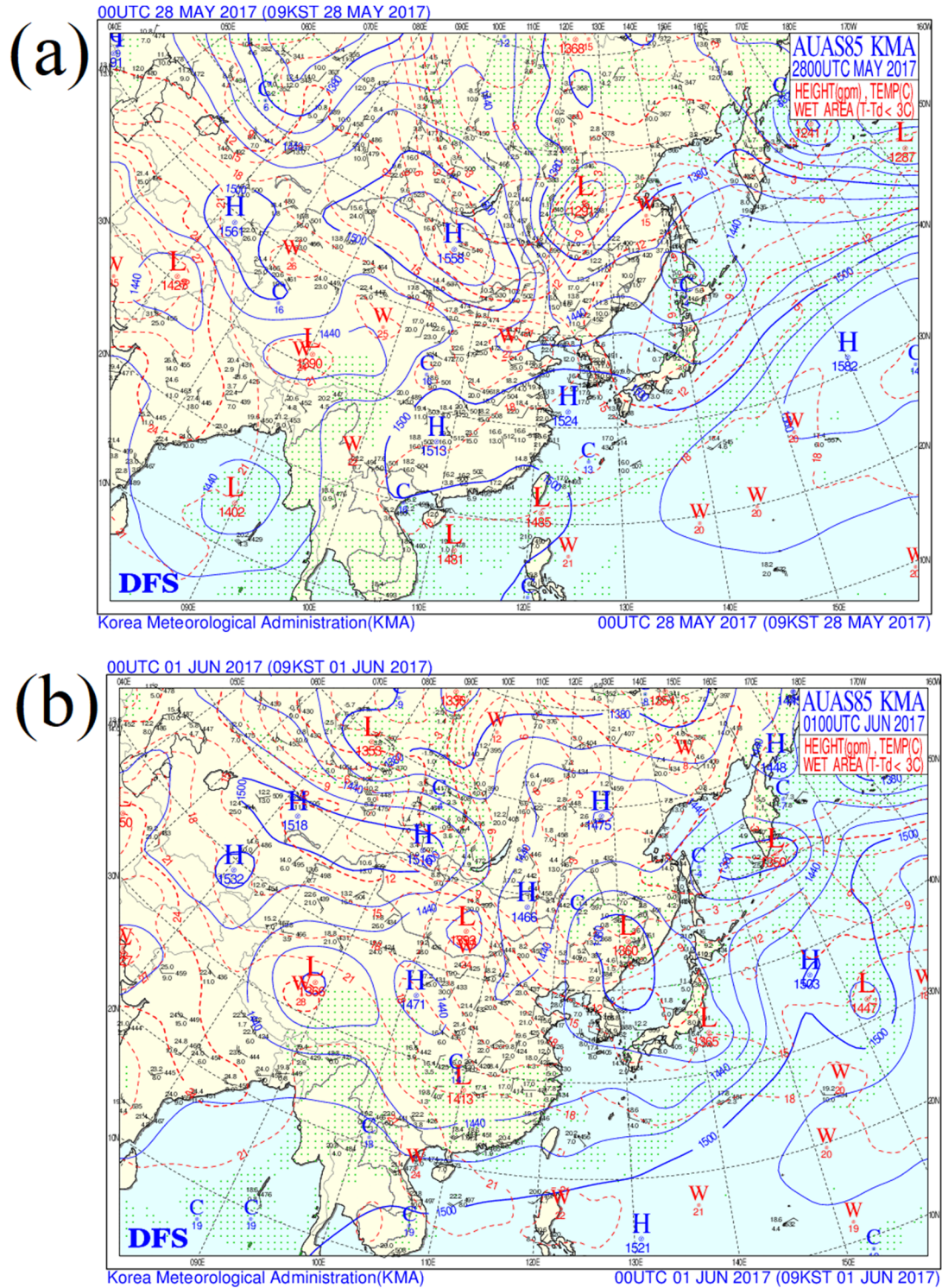
Figure S1. Weather charts at the 850 hPa layer over the East Asia at 00:00 UTC on (a) 28 May and

(b) 1 June in 2017, indicating the weather patterns of under high pressure and uniform pressure field, respectively.
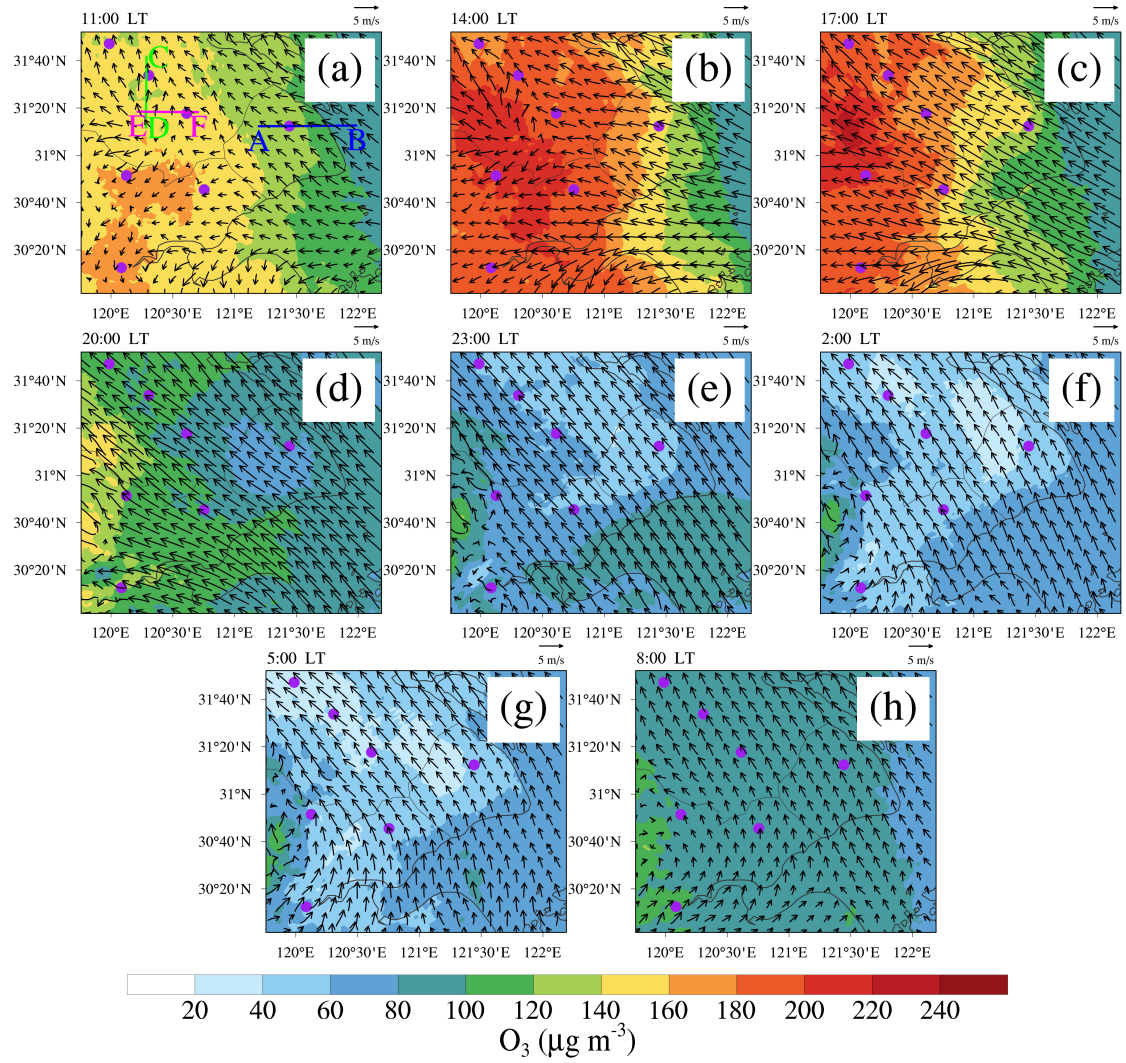
Figure S2. Same as Figure 7, but for the USGS_noAH simulation.
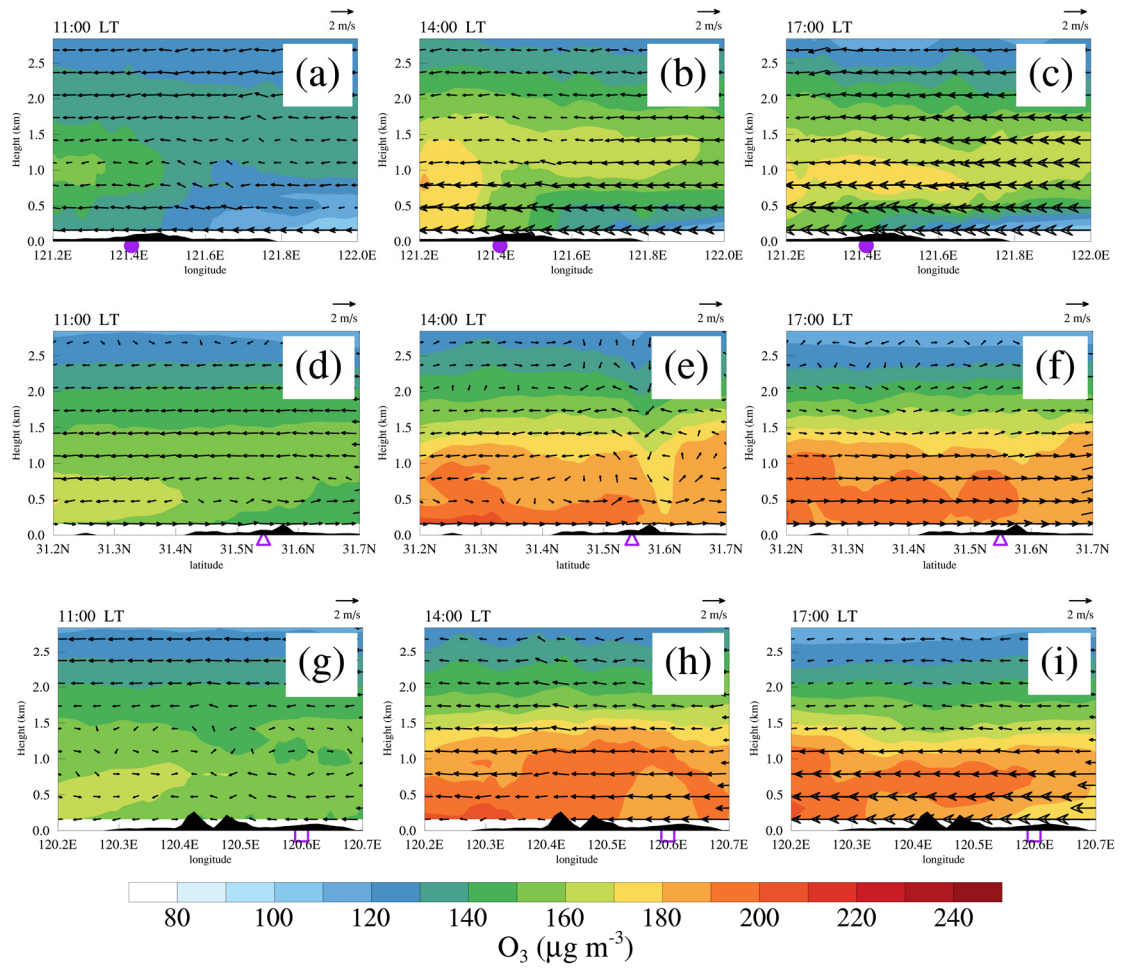
Figure S3. Same as Figure 9, but for the USGS_noAH simulation.
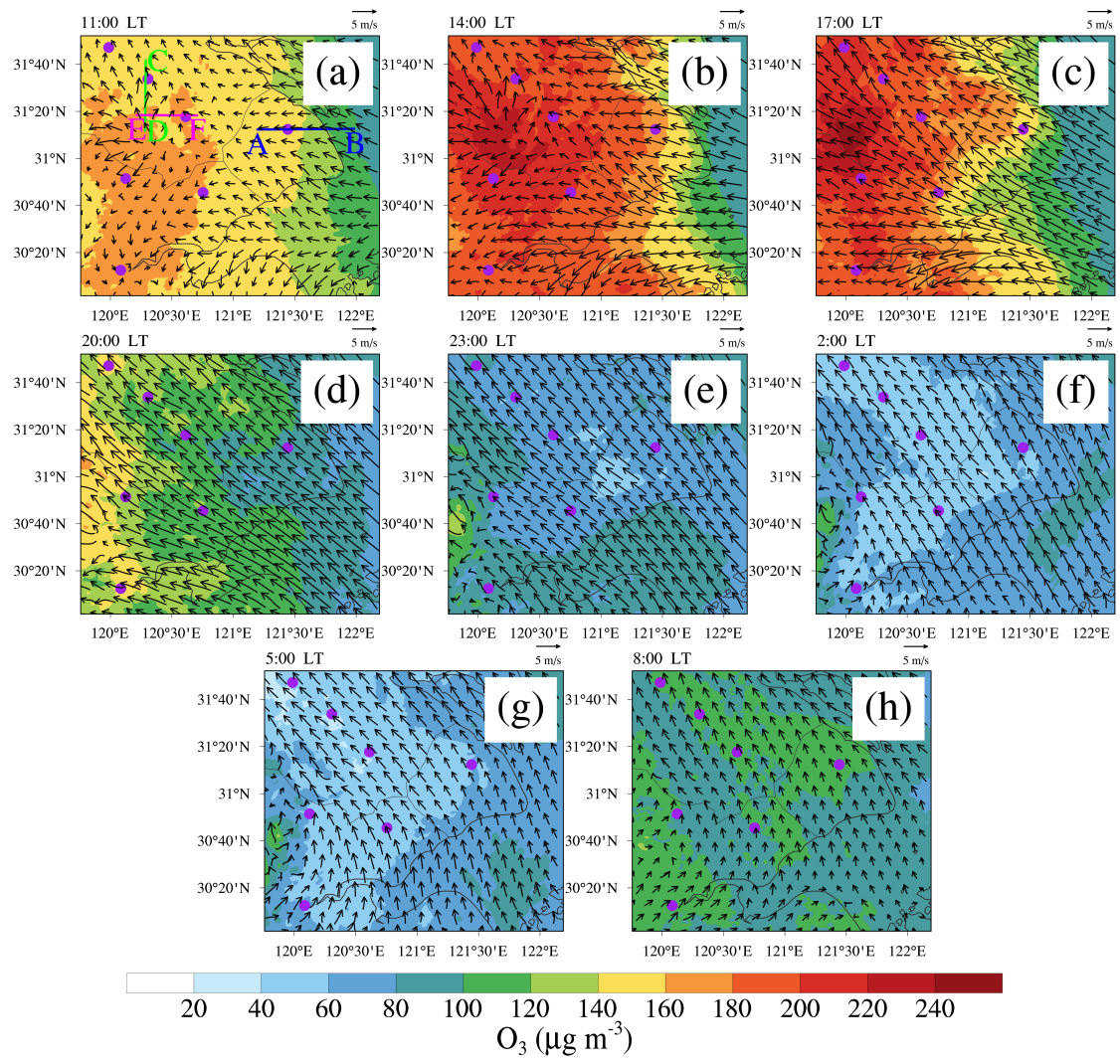
Figure S4. Same as Figure 7, but for the MODIS_withAH simulation.
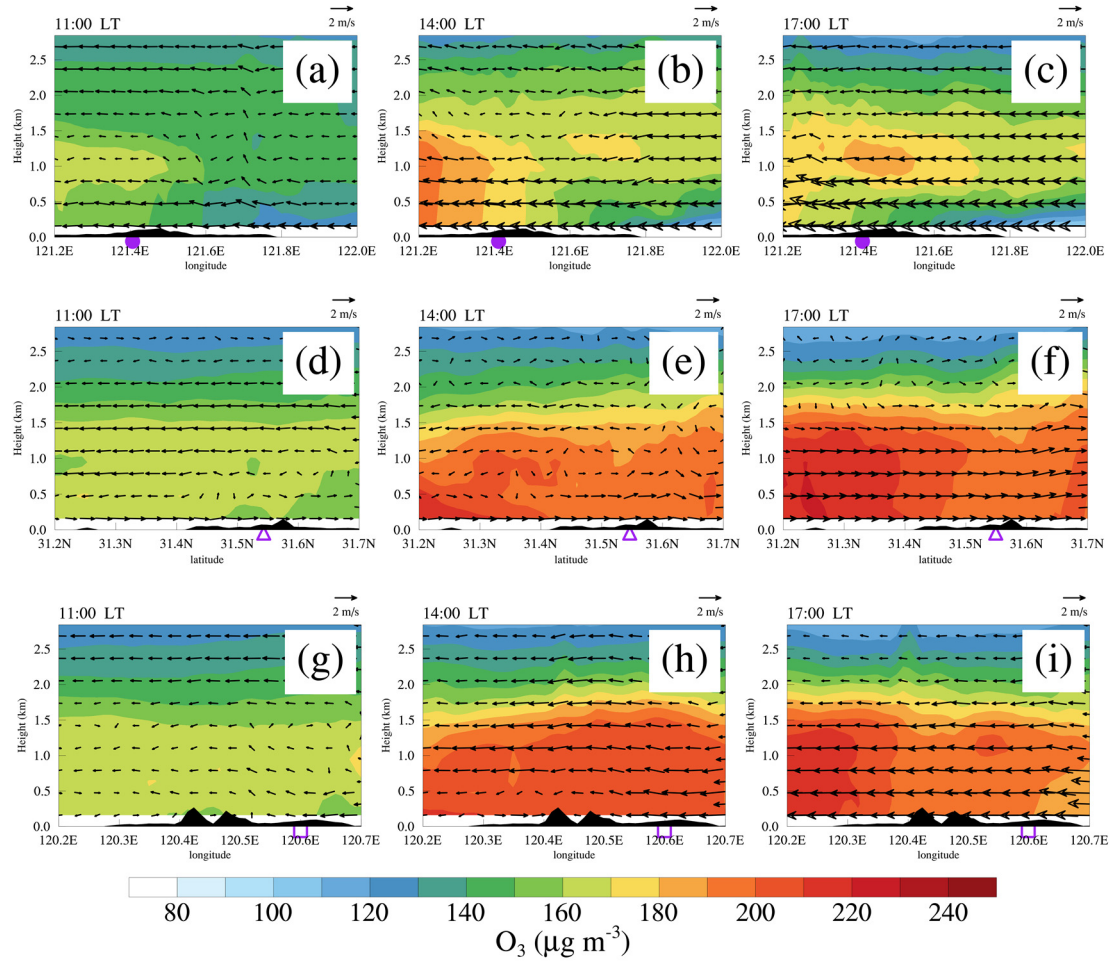
Figure S5. Same as Figure 9, but for the MODIS_withAH simulation.