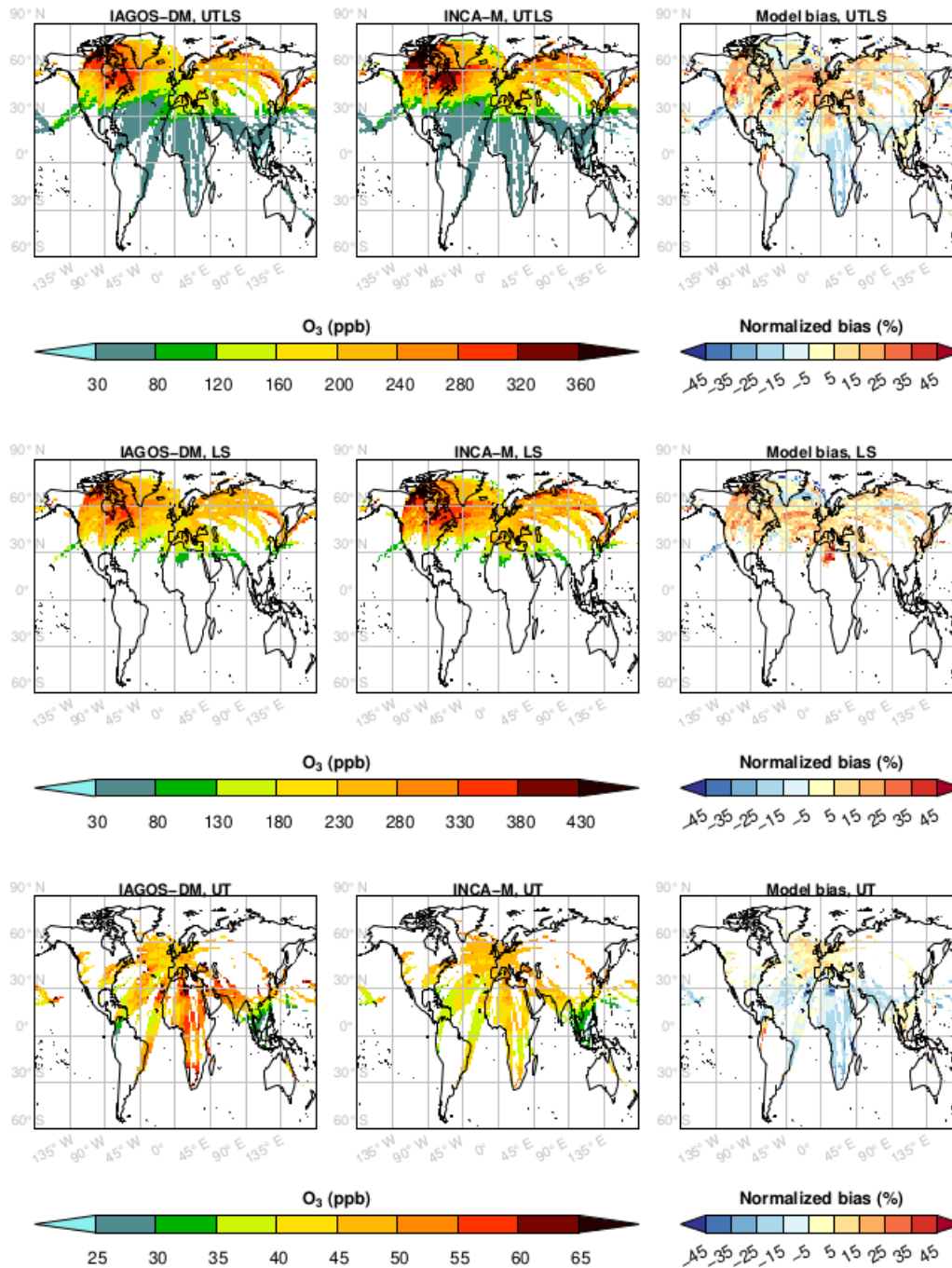# 1 Ozone

Figure 1. Ozone mean horizontal distributions during boreal winter from the end of 1994 until 2017, for the products IAGOS-DM (left) and INCA-M (middle), and the biases (right) normalized with respect to the mean values between the two products. Each row displays a layer, with the non-separated UTLS at the top and the distinct LS and UT below.
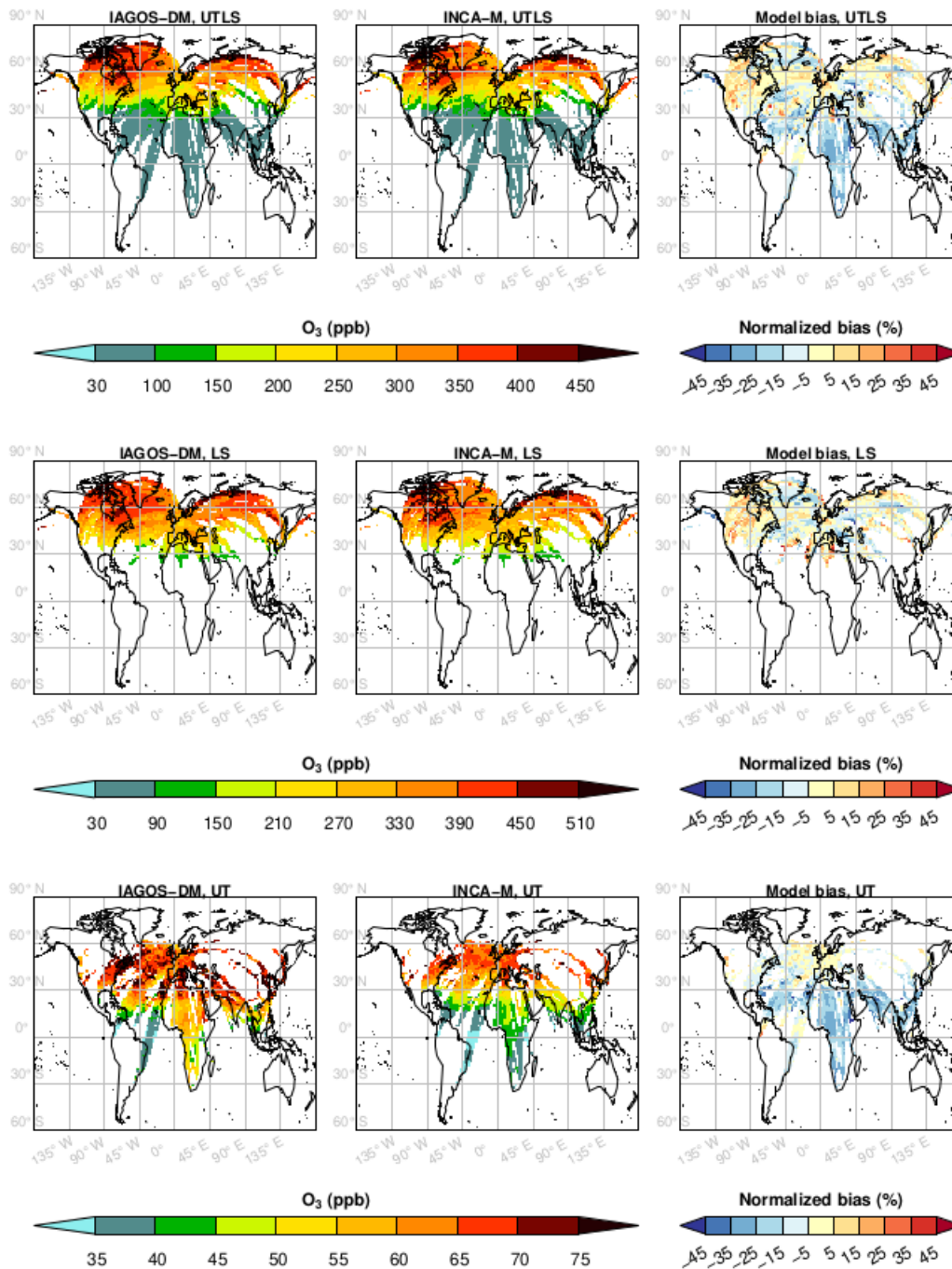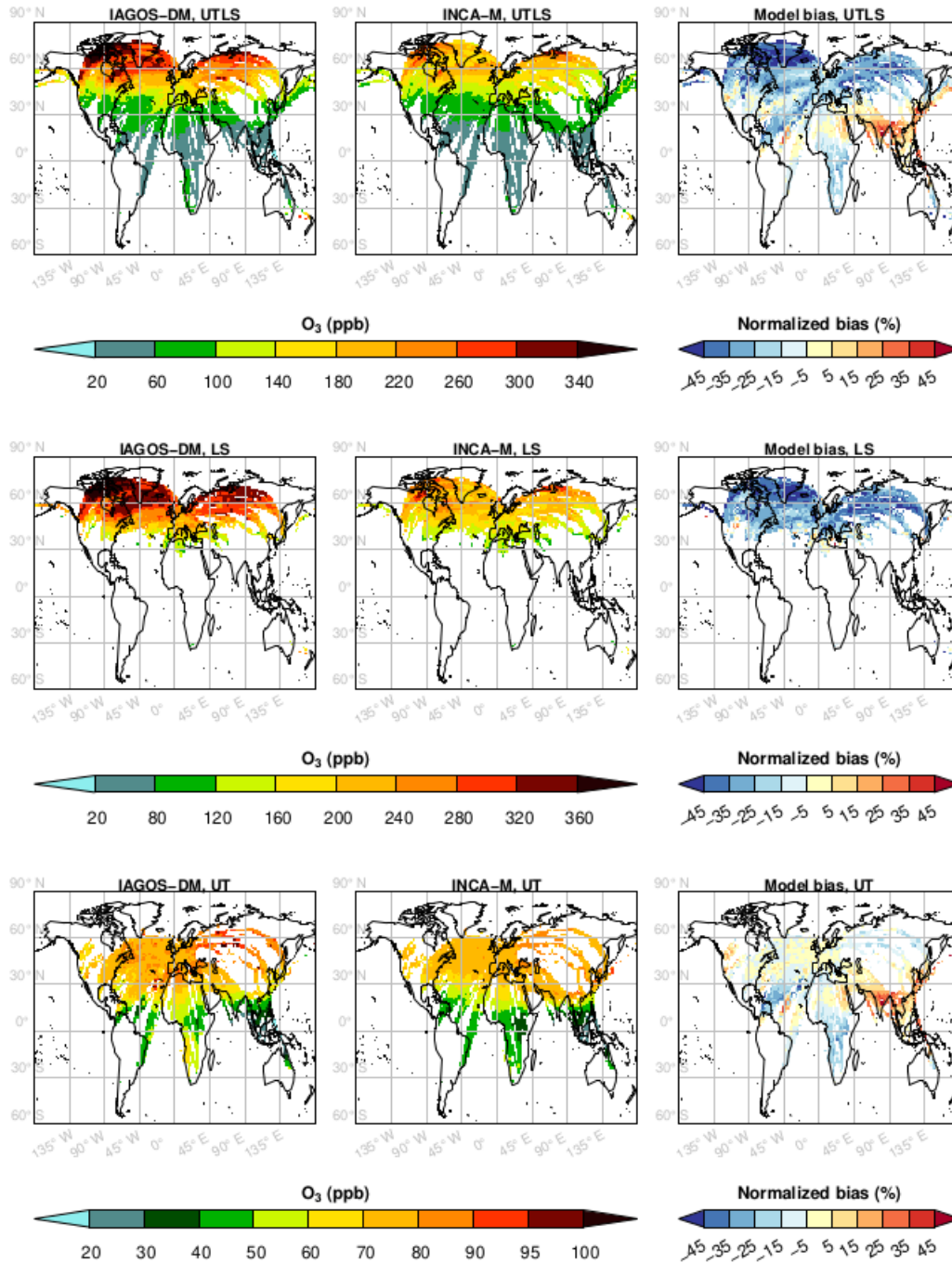
Figure 2. As Fig. 1 for boreal spring.

O$_3$ – JJA

Figure 3. As Fig. 1 for boreal summer.
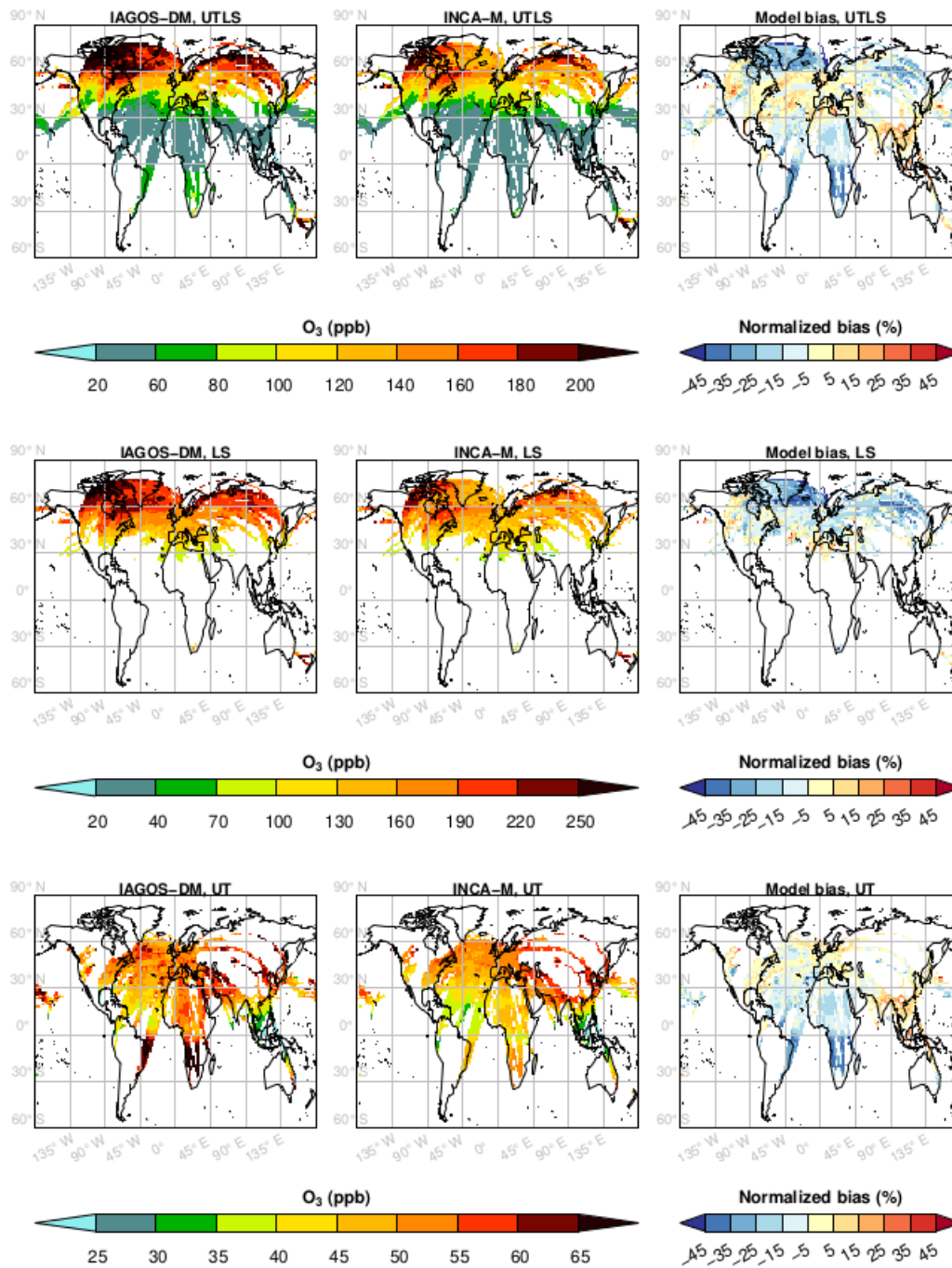
2   Carbon monoxide

O₃ – SON

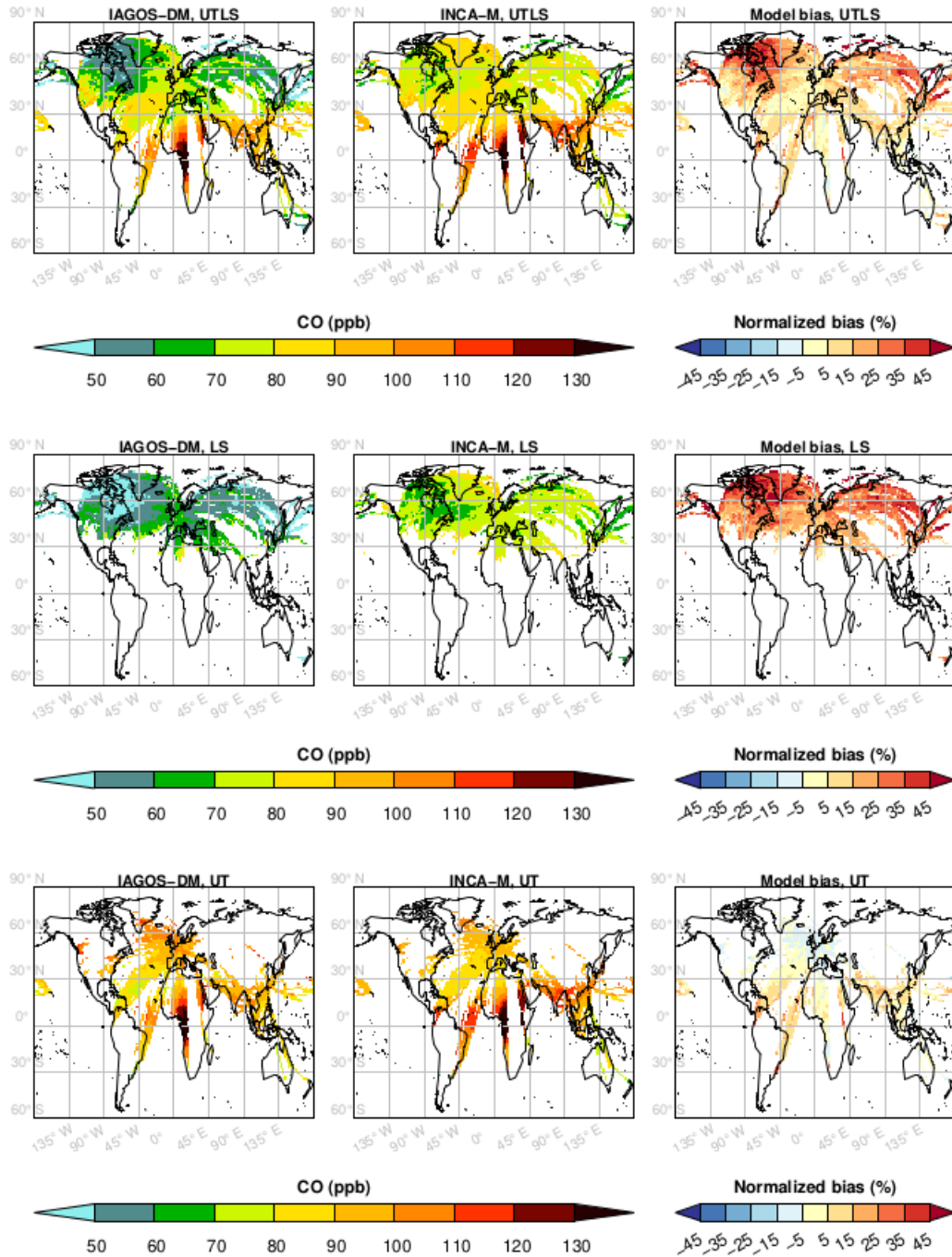**Figure 4.** As Fig. 1 for boreal fall.

Figure 5. CO mean horizontal distributions during boreal winter from the end of 2001 until 2017, for the products IAGOS-DM (left) and INCA-M (middle), and the biases (right) normalized with respect to the mean values between the two products. Each row displays a layer, with the non-separated UTLS at the top and the distinct LS and UT below.
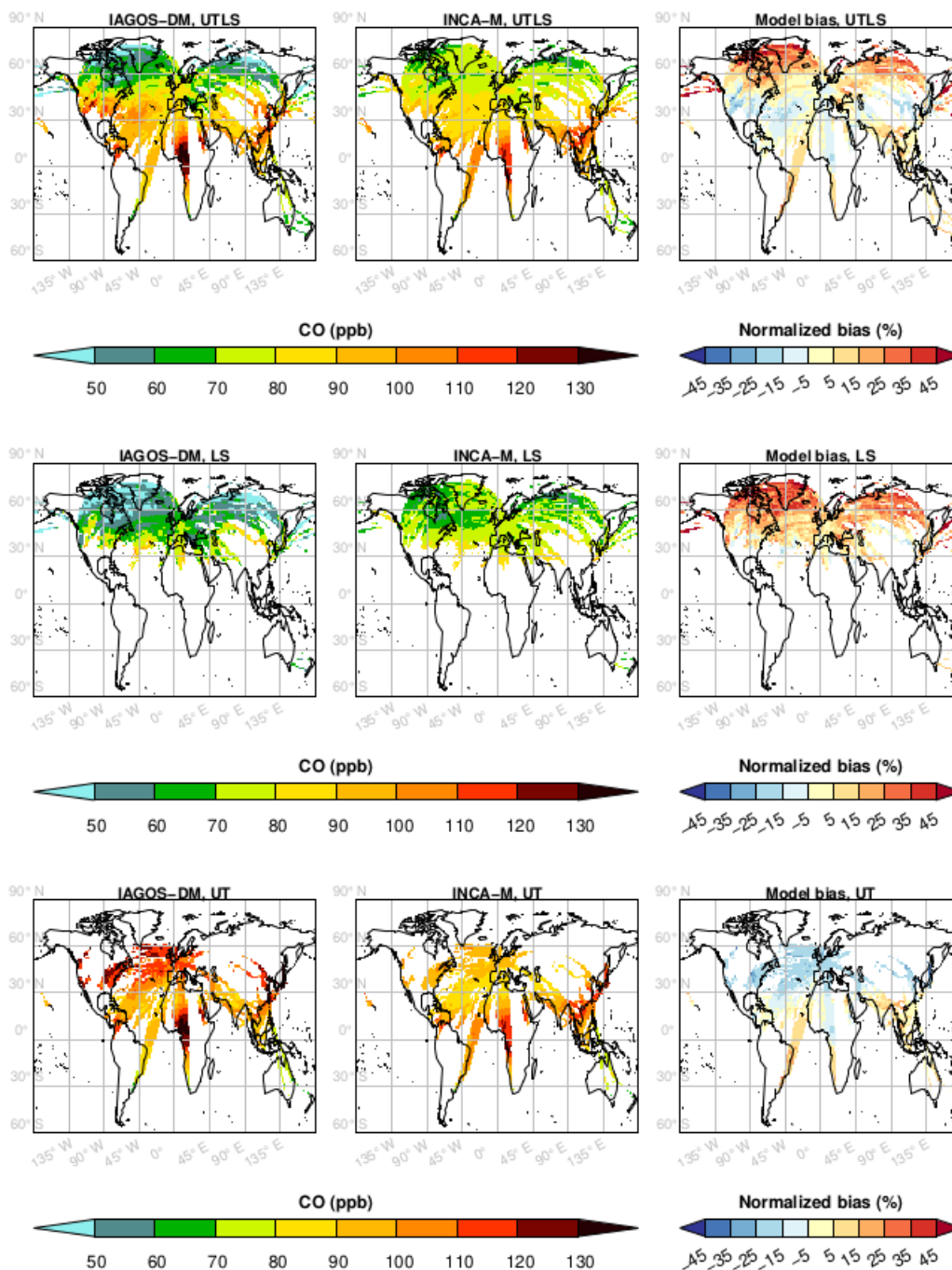
CO – MAM

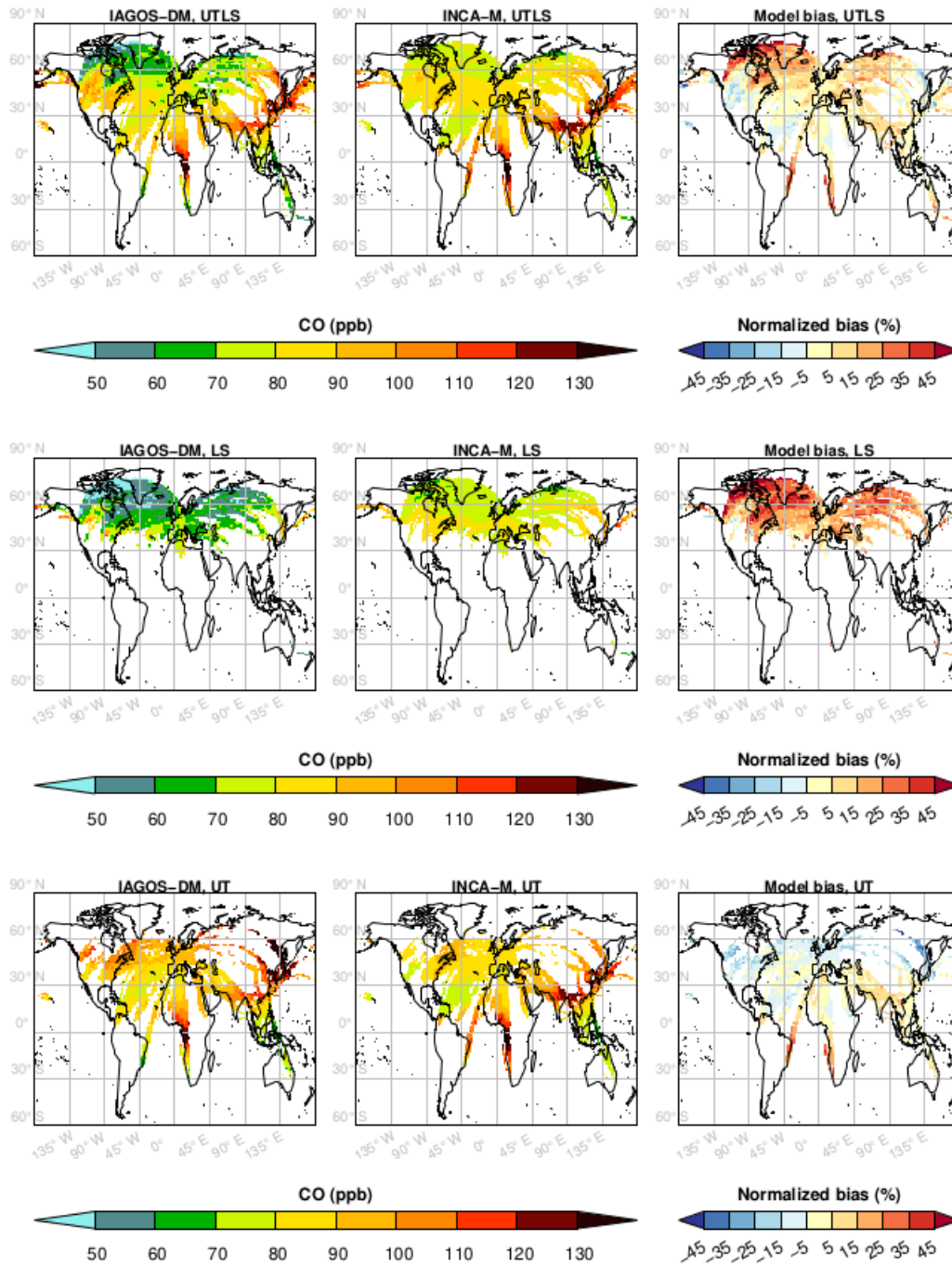**Figure 6.** As Fig. 5 for boreal spring.

CO – JJA

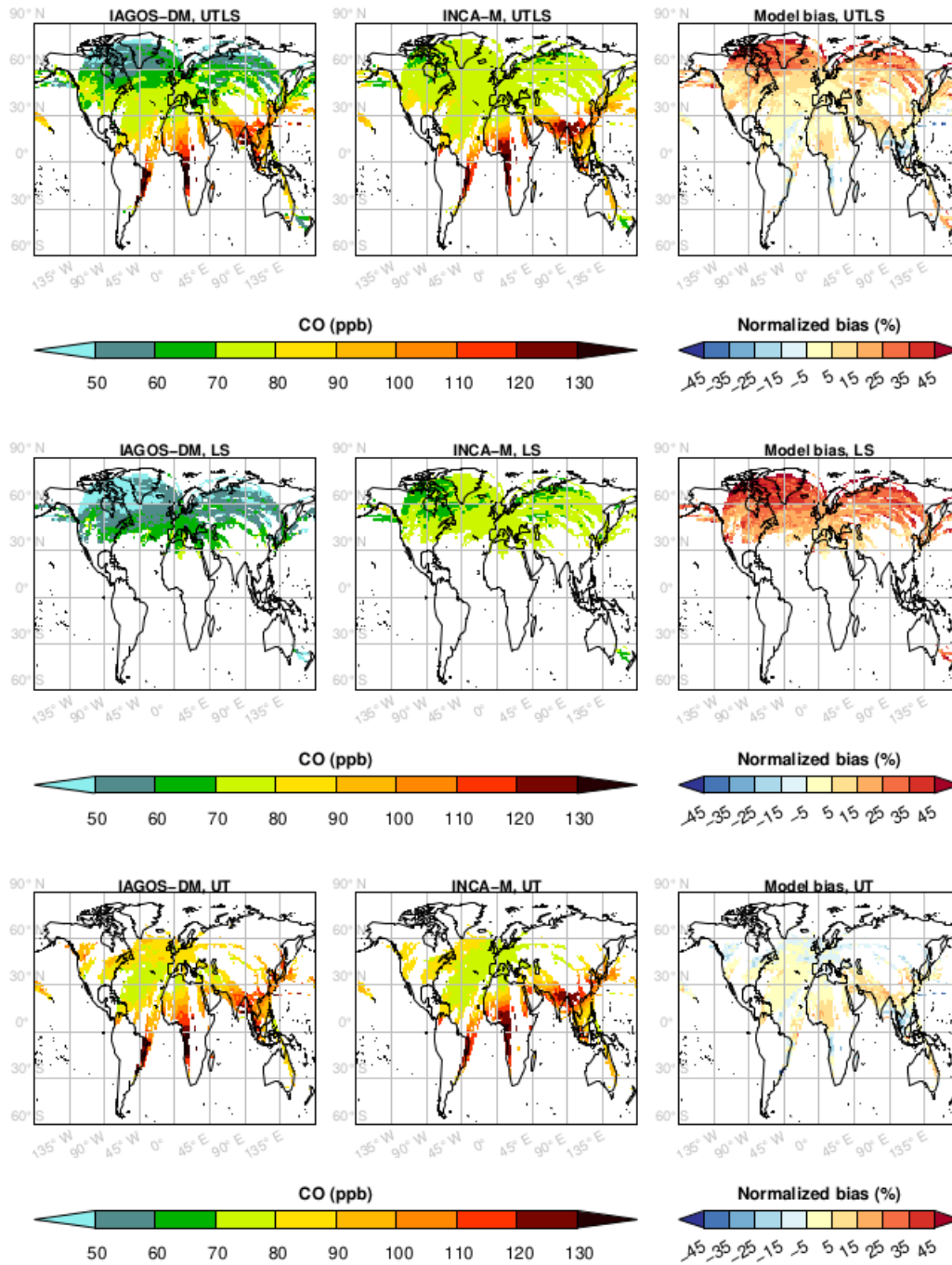**Figure 7.** As Fig. 5 for boreal summer.

CO – SON

Figure 8. As Fig. 5 for boreal fall.
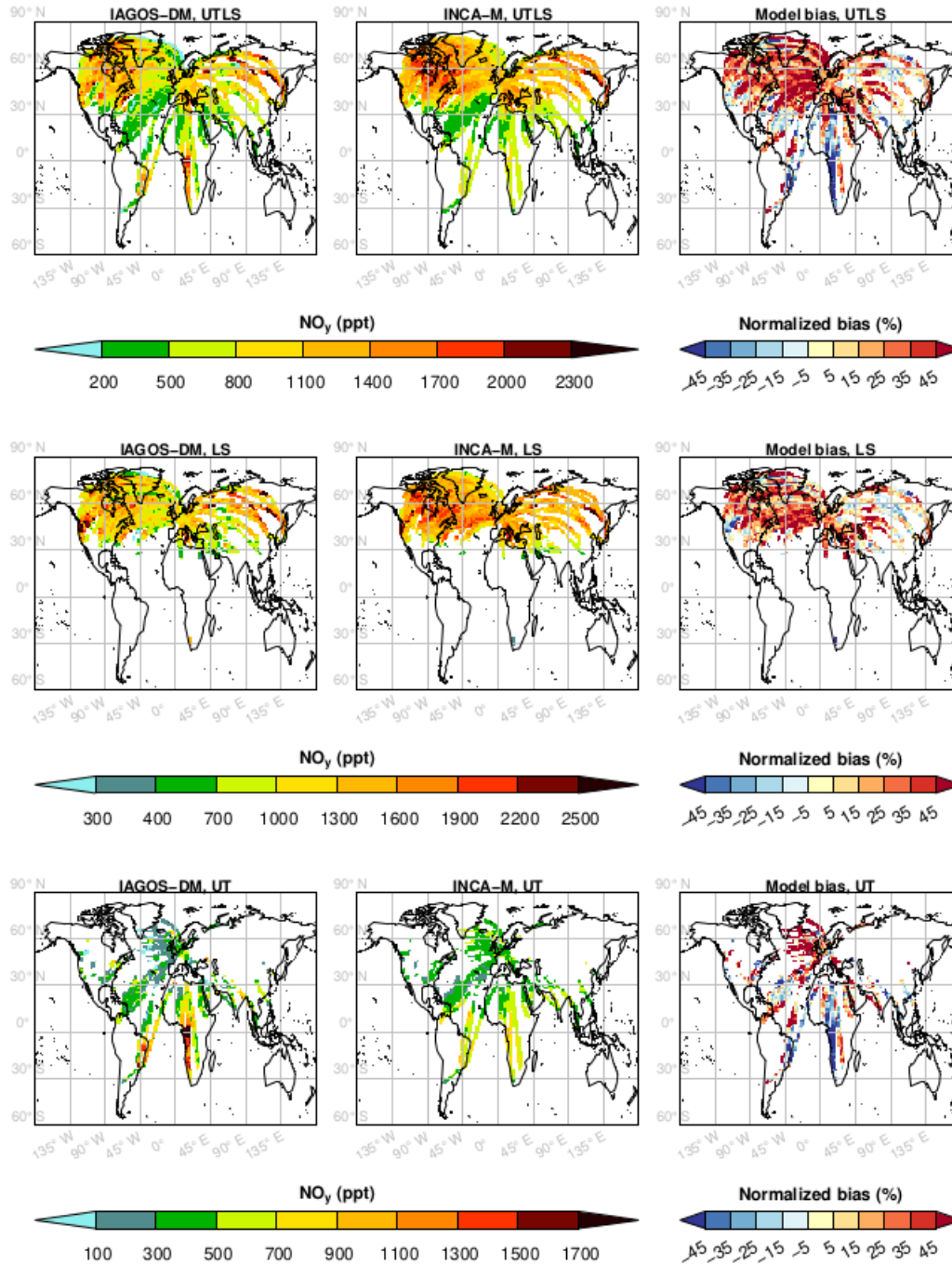
3 Reactive nitrogen

Figure 9. NO$_y$ mean horizontal distributions during boreal winter from the end of 1999 until 2017, for the products IAGOS-DM (left) and INCA-M (middle), and the biases (right) normalized with respect to the mean values between the two products. Each row displays a layer, with the non-separated UTLS at the top and the distinct LS and UT below.
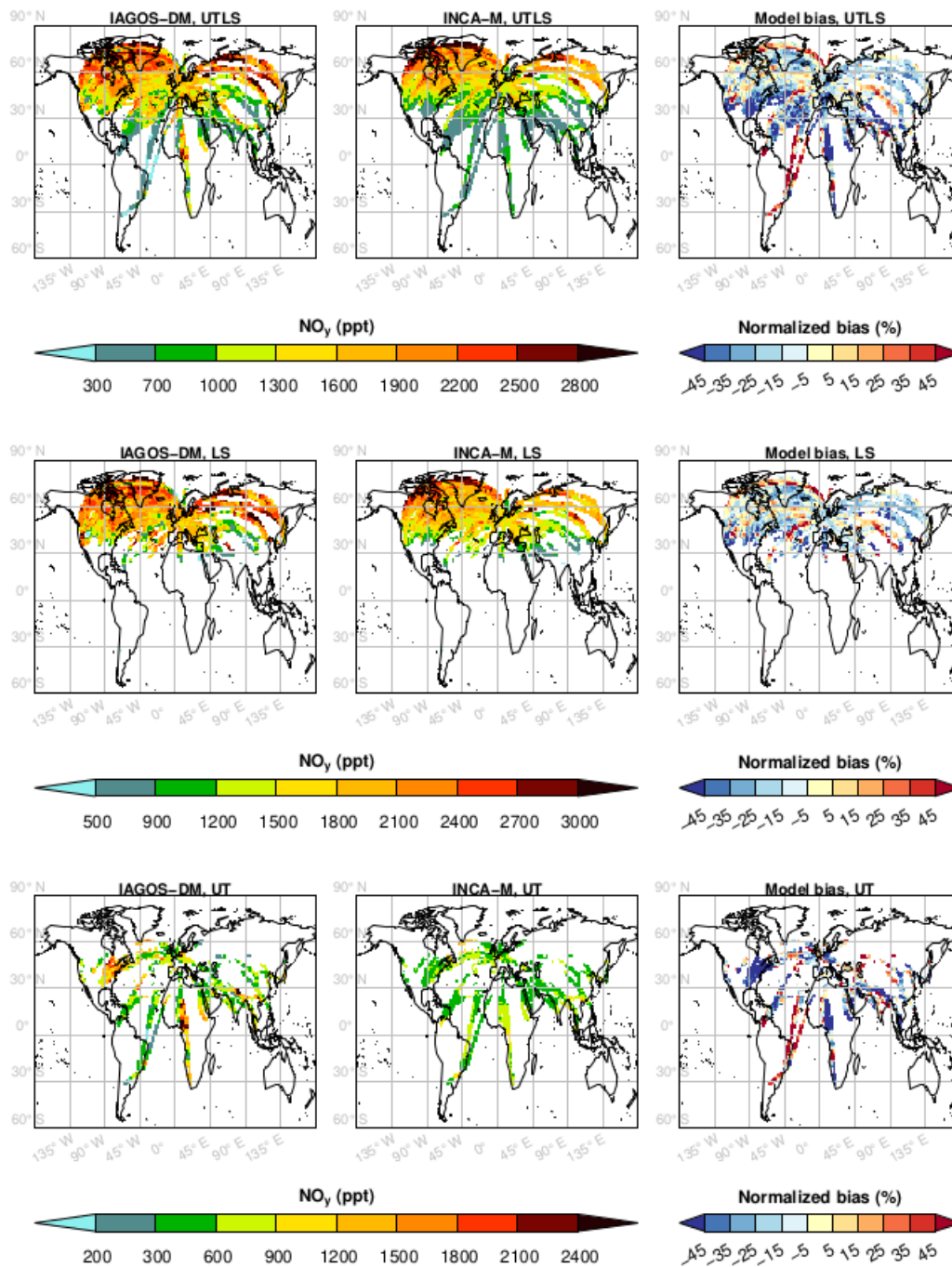
NO$_y$ – MAM

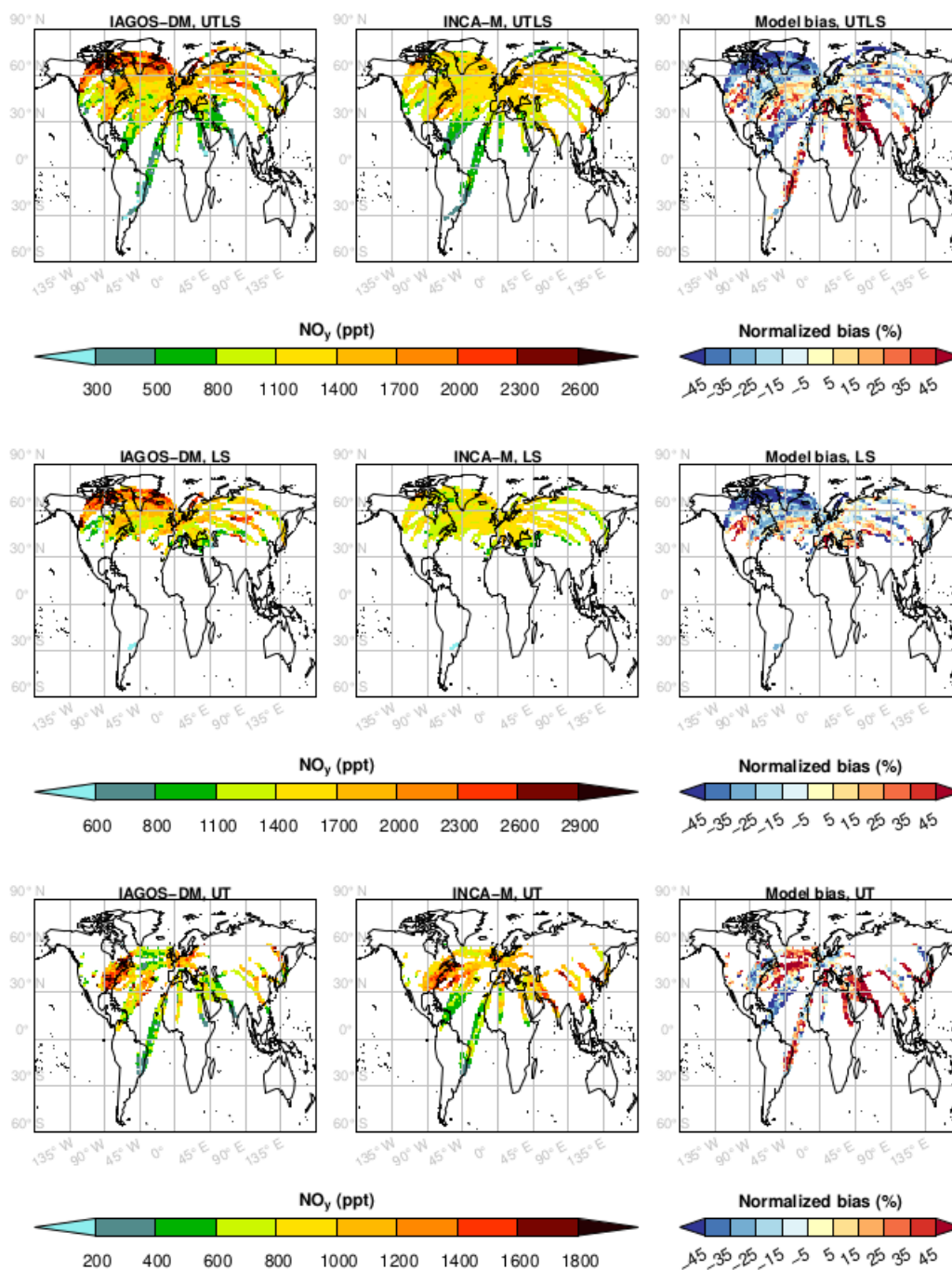**Figure 10.** As Fig. 9 for boreal spring.

NO$_y$ – JJA

Figure 11. As Fig. 9 for boreal summer.
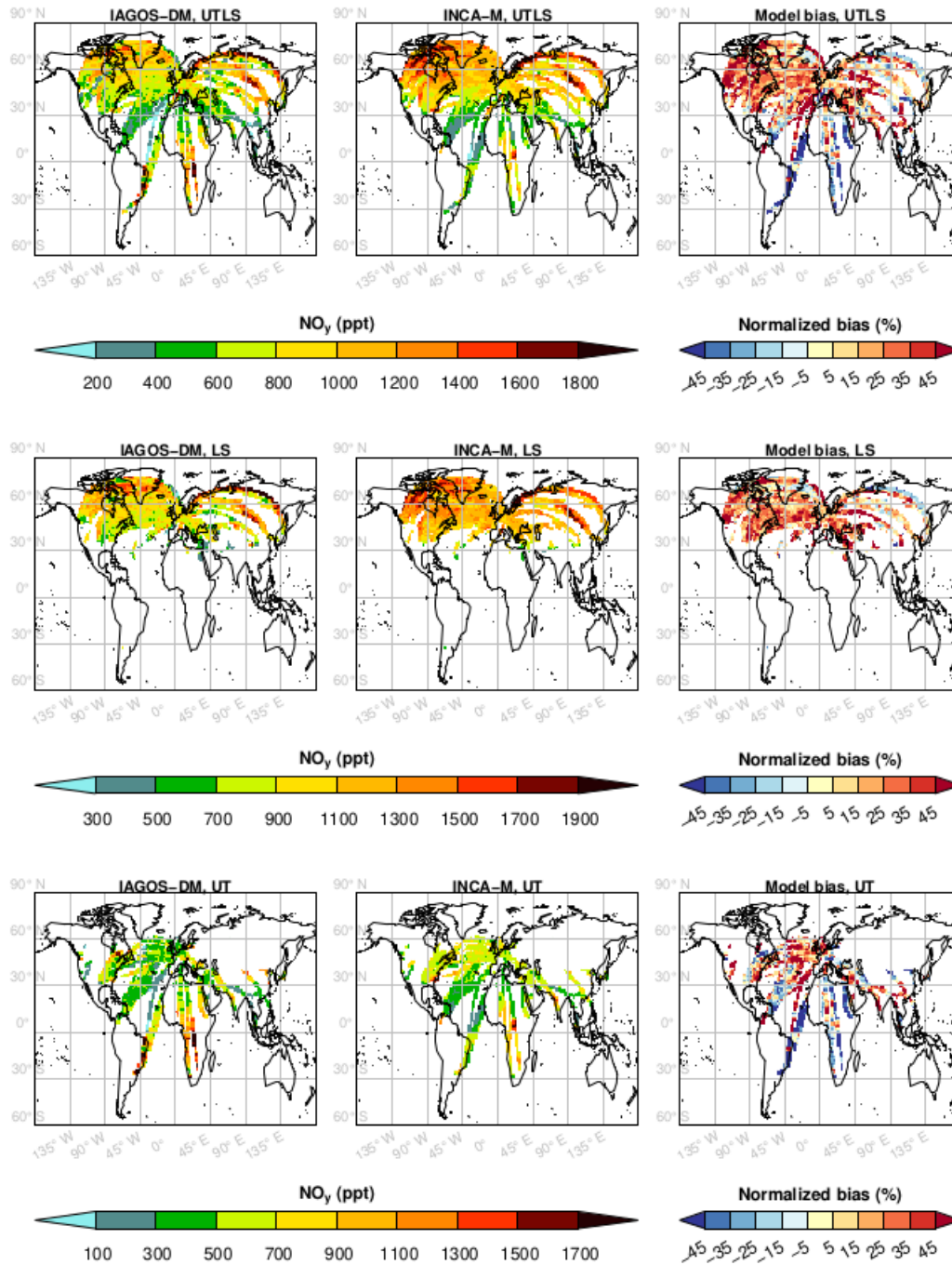
4 Water vapour

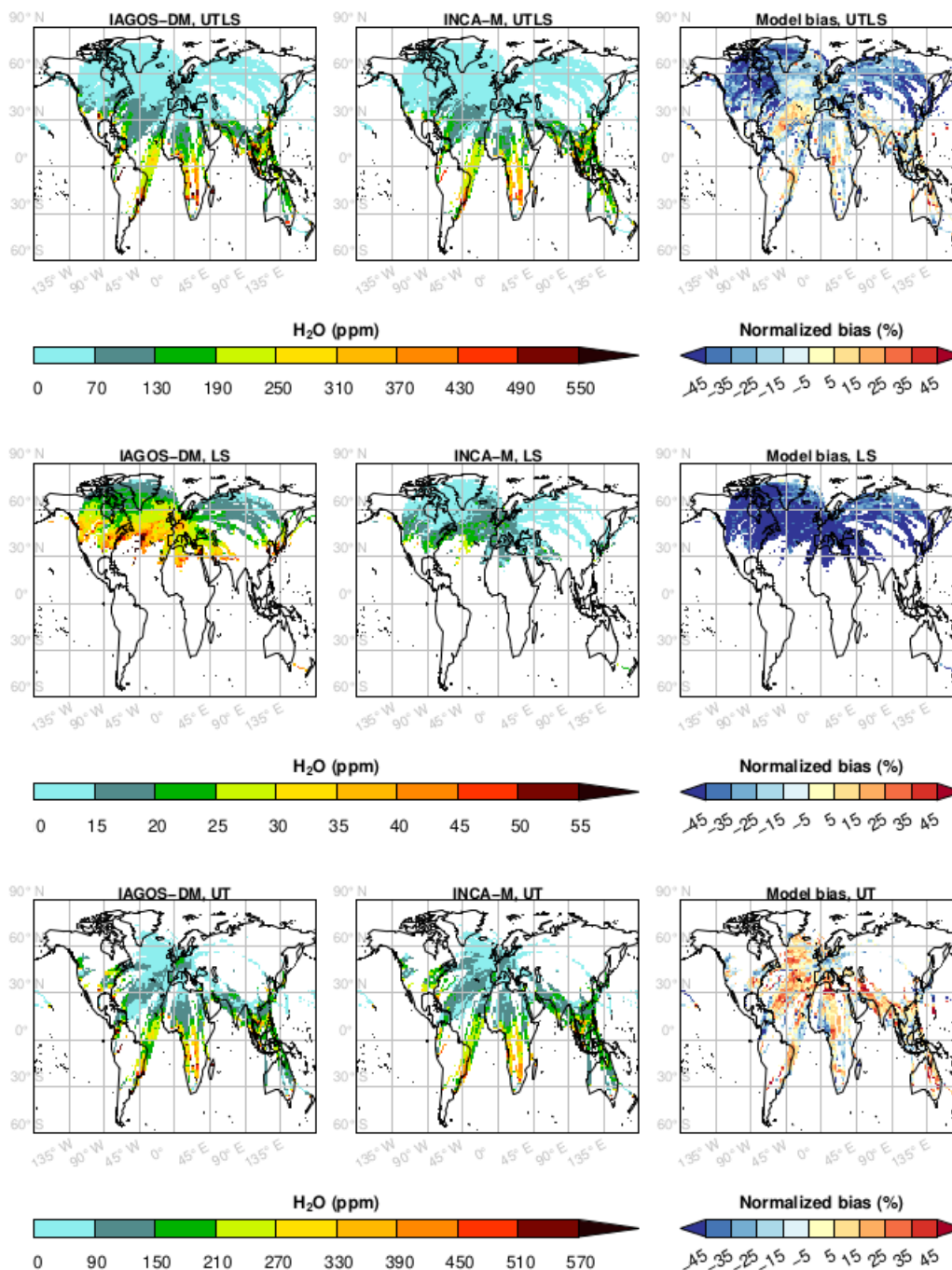**Figure 12.** As Fig. 9 for boreal fall.

H₂O – DJF

Figure 13. Water vapour mean horizontal distributions during boreal winter from the end of 1994 until 2017, for the products IAGOS-DM (left) and INCA-M (middle), and the biases (right) normalized with respect to the mean values between the two products. Each row displays a layer, with the non-separated UTLS at the top and the distinct LS and UT below. Please note that the LS climatology is representative of lower altitudes than for the other species, as explained in the manuscript.
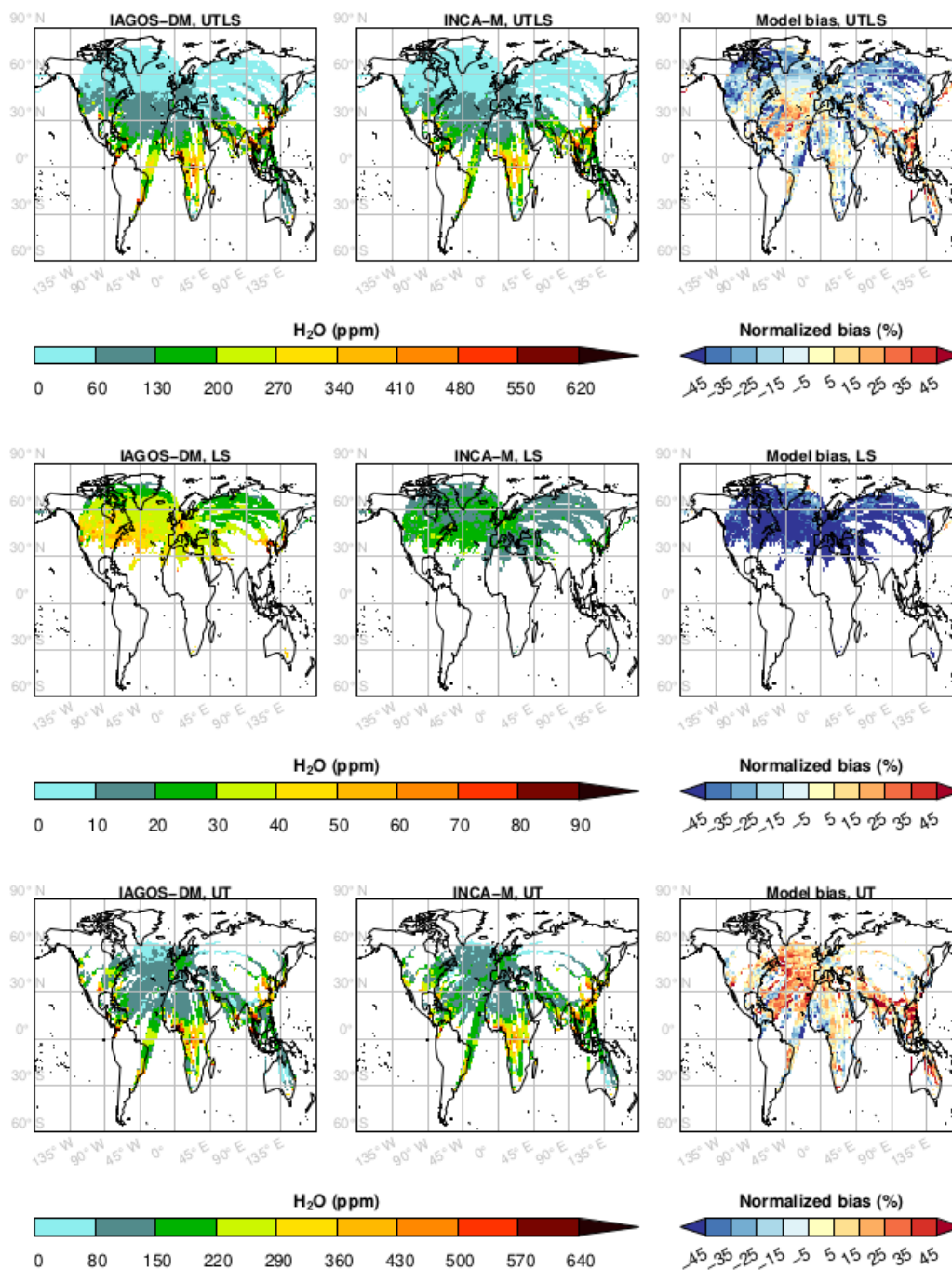
H$_2$O – MAM

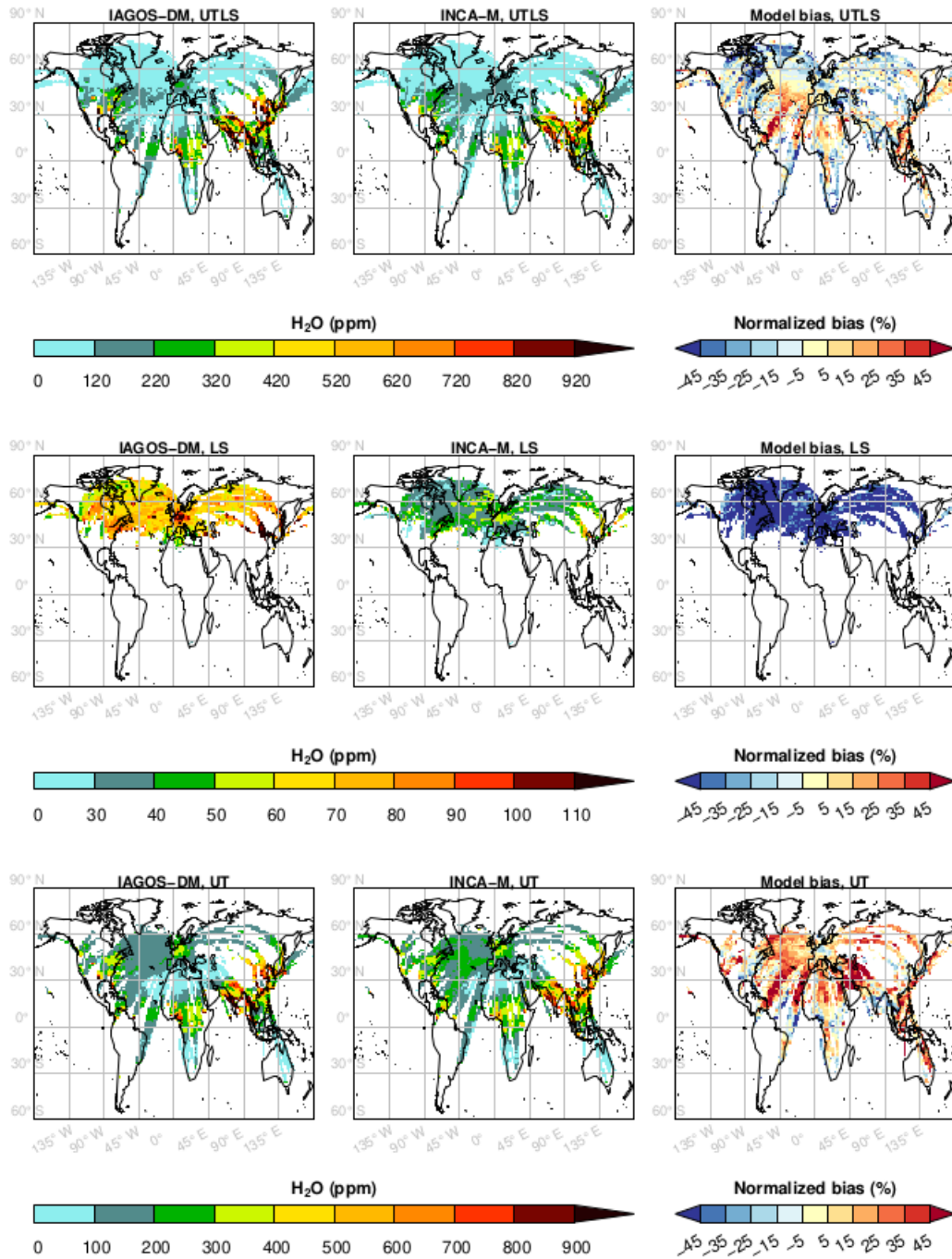**Figure 14.** As Fig. 13 for boreal spring.
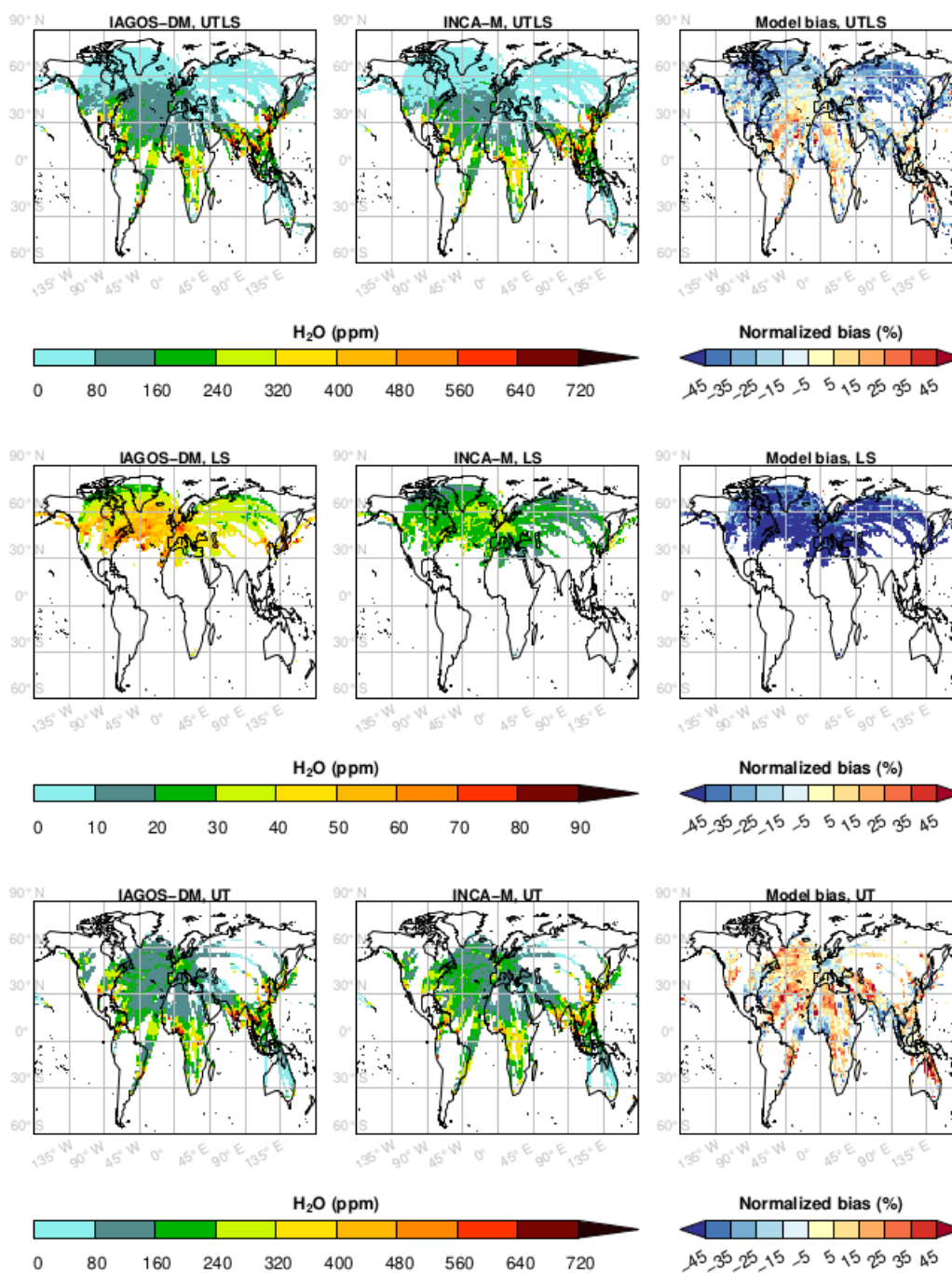
H₂O – JJA

Figure 15. As Fig. 13 for boreal summer.

H₂O – SON

Figure 16. As Fig. 13 for boreal fall.