

Final meeting, 18 March 2008

**‘The added value of satellite observations  
of aerosol optical depth for operational air  
quality forecasts’**

Validity of nature run in comparison to LOTOS-  
EUROS model



# Difference LOTOS-EUROS – nature run

Differences LOTOS-EUROS – Nature run



Differences LOTOS-EUROS – real measurements

# Difference LOTOS-EUROS – nature run PM2.5

<b>LE vs measurements</b>		AT02	DE02	DE03	DE04	IT04	DE737	GB36	GB617	average
correlation	hourly summer						0.55	0.20	0.61	<b>0.46</b>
	hourly winter						0.51	0.46	0.38	<b>0.45</b>
	daily summer	0.70	0.48	0.67	0.73	0.47	0.76	0.93	0.94	<b>0.71</b>
	daily winter	0.72	0.81	0.24	0.56		0.58	0.63	0.60	<b>0.59</b>
RMSE	hourly summer						10.18	12.39	10.53	<b>11.03</b>
	hourly winter						18.77	9.28	10.42	<b>12.82</b>
	daily summer	9.88	7.41	8.69	10.20	11.46	8.88	11.38	9.15	<b>9.63</b>
	daily winter	55.2	44.44	7.75	15.76		16.26	8.09	8.91	<b>22.34</b>
bias	hourly summer						-7.71	-8.87	-7.11	<b>-7.90</b>
	hourly winter						-11.98	-5.48	-5.139	<b>-7.53</b>
	daily summer	-9.06	-6.14	-7.65	-8.48	-8.96	-7.65	-8.99	-7.05	<b>-8.00</b>
	daily winter	-46	-28.45	2.55	-11.87		-11.92	-5.43	-5.09	<b>-15.17</b>

<b>LE vs nature run</b>		AT02	DE02	DE03	DE04	IT04	DE737	GB36	GB617	average
correlation	hourly summer						0.63	0.50	0.36	<b>0.50</b>
	hourly winter						0.59	0.72	0.69	<b>0.67</b>
	daily summer	0.67	0.64	0.68	0.70	0.80	0.82	0.81	0.63	<b>0.72</b>
	daily winter	0.58	0.59	0.69	0.71		0.71	0.83	0.78	<b>0.70</b>
RMSE	hourly summer						5.89	5.25	6.00	<b>5.71</b>
	hourly winter						11.45	7.26	9.35	<b>9.35</b>
	daily summer	2.55	2.46	4.22	3.48	2.25	4.39	3.45	4.61	<b>3.42</b>
	daily winter	7.32	7.09	4.60	7.16		9.83	5.62	7.28	<b>6.98</b>
bias	hourly summer						-3.26	0.39	1.57	<b>-0.43</b>
	hourly winter						-7.06	-2.96	-3.90	<b>-4.64</b>
	daily summer	-1.14	1.20	-1.96	-1.53	1.17	-3.21	0.44	1.64	<b>-0.42</b>
	daily winter	-1.94	-3.13	1.52	-4.71		-7.00	-2.91	-3.85	<b>-3.15</b>



# Difference LOTOS-EUROS – nature run

LE vs measurements		AT02	DE02	DE03	DE04	IT04	DE737	GB36	GB617	average
correlation	hourly summer						0.55	0.20	0.61	<b>0.46</b>
	hourly winter						0.51	0.46	0.38	<b>0.45</b>
	daily summer	0.70	0.48	0.67	0.73	0.47	0.76	0.93	0.94	<b>0.71</b>
	daily winter	0.72	0.81	0.24	0.56		0.58	0.63	0.60	<b>0.59</b>
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	daily winter	-46	-28.45	2.55	-11.87		-11.92	-5.43	-5.09	<b>-15.17</b>

AIRBASE and  
EMEP  
Rural background  
stations

LE vs nature run		AT02	DE02	DE03	DE04	IT04	DE737	GB36	GB617	average
correlation	hourly summer						0.63	0.50	0.36	<b>0.50</b>
	hourly winter						0.59	0.72	0.69	<b>0.67</b>
	daily summer	0.67	0.64	0.68	0.70	0.80	0.82	0.81	0.63	<b>0.72</b>
	daily winter	0.58	0.59	0.69	0.71		0.71	0.83	0.78	<b>0.70</b>
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# Correlation



# Correlation daily values

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# Correlation hourly values

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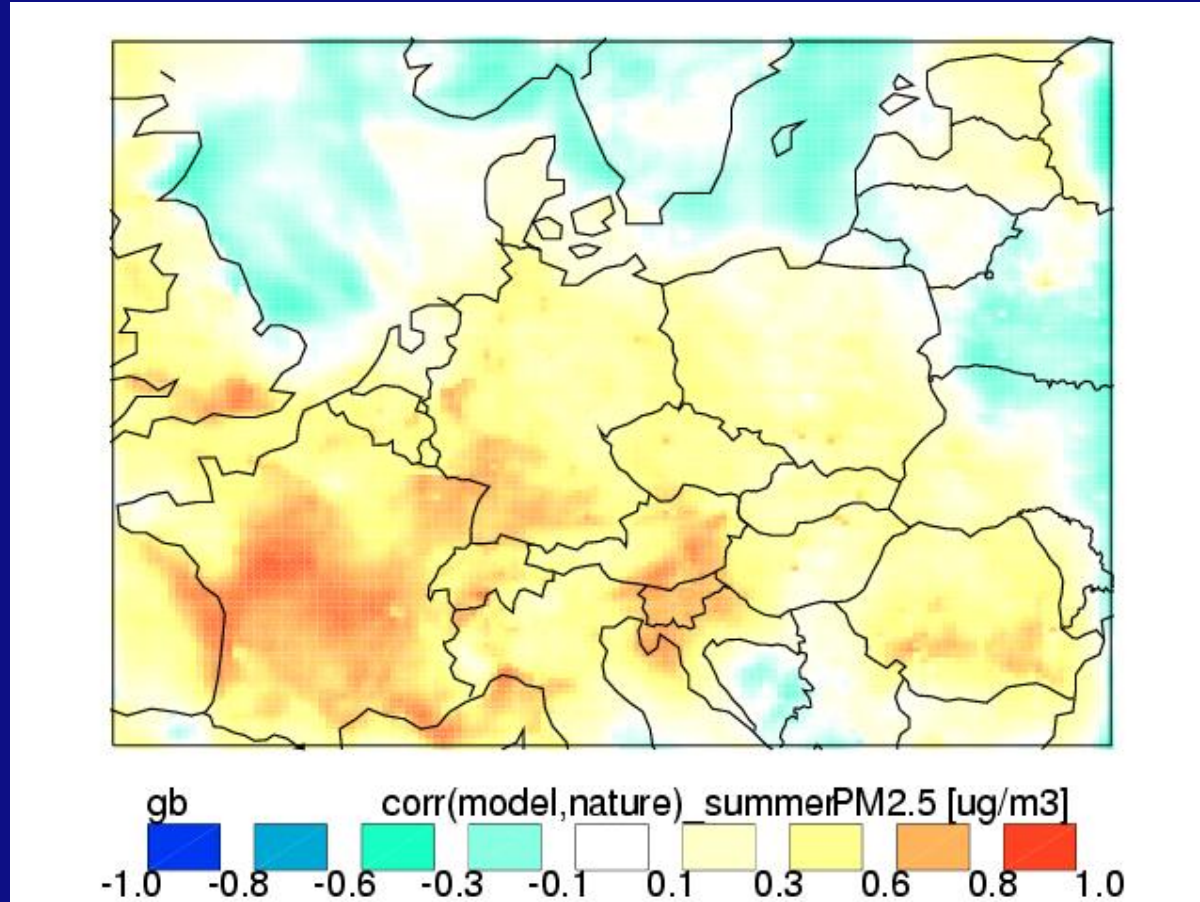
<b>LE vs nature run</b>		AT02	DE02	DE03	DE04	IT04	DE737	GB36	GB617	average
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	hourly winter						0.59	0.72	0.69	<b>0.67</b>	<b>0.57</b>
	daily summer	0.67	0.64	0.68	0.70	0.80	0.82	0.81	0.63	<b>0.72</b>	<b>0.49</b>
	daily winter	0.58	0.59	0.69	0.71		0.71	0.83	0.78	<b>0.70</b>	<b>0.68</b>
RMSE	hourly summer						5.89	5.25	6.00	<b>5.71</b>	4.83
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	daily summer	-1.14	1.20	-1.96	-1.53	1.17	-3.21	0.44	1.64	<b>-0.42</b>	0.21
	daily winter	-1.94	-3.13	1.52	-4.71		-7.00	-2.91	-3.85	<b>-3.15</b>	-1.88

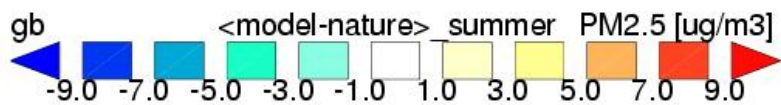
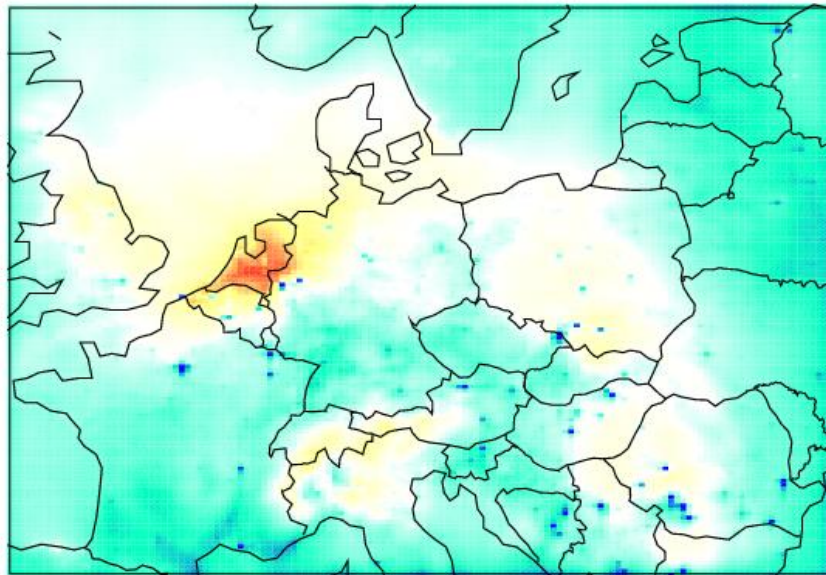
# Correlation LE-nature run halfhourly values, summer period



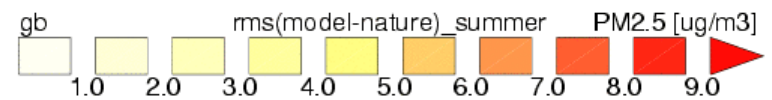
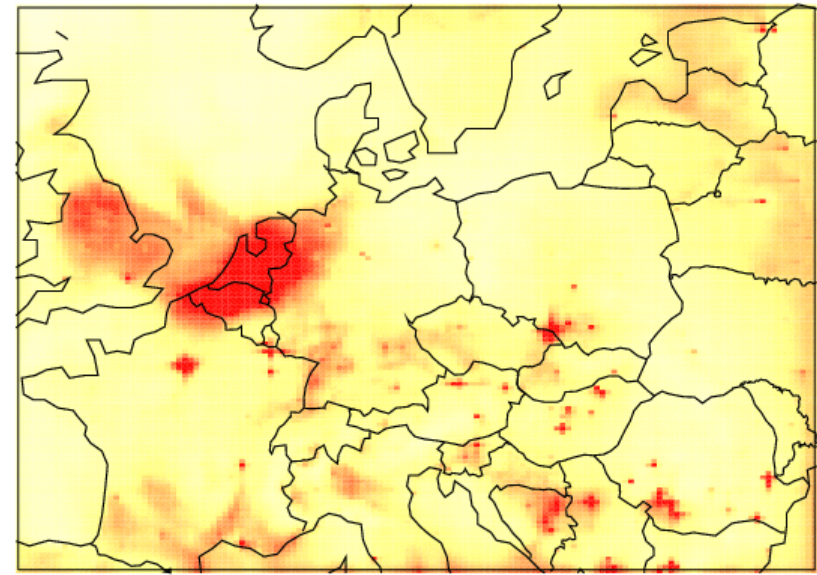
# Bias and RMSE



# Bias and RMSE LE – nature run PM2.5 halfhourly values, summer period

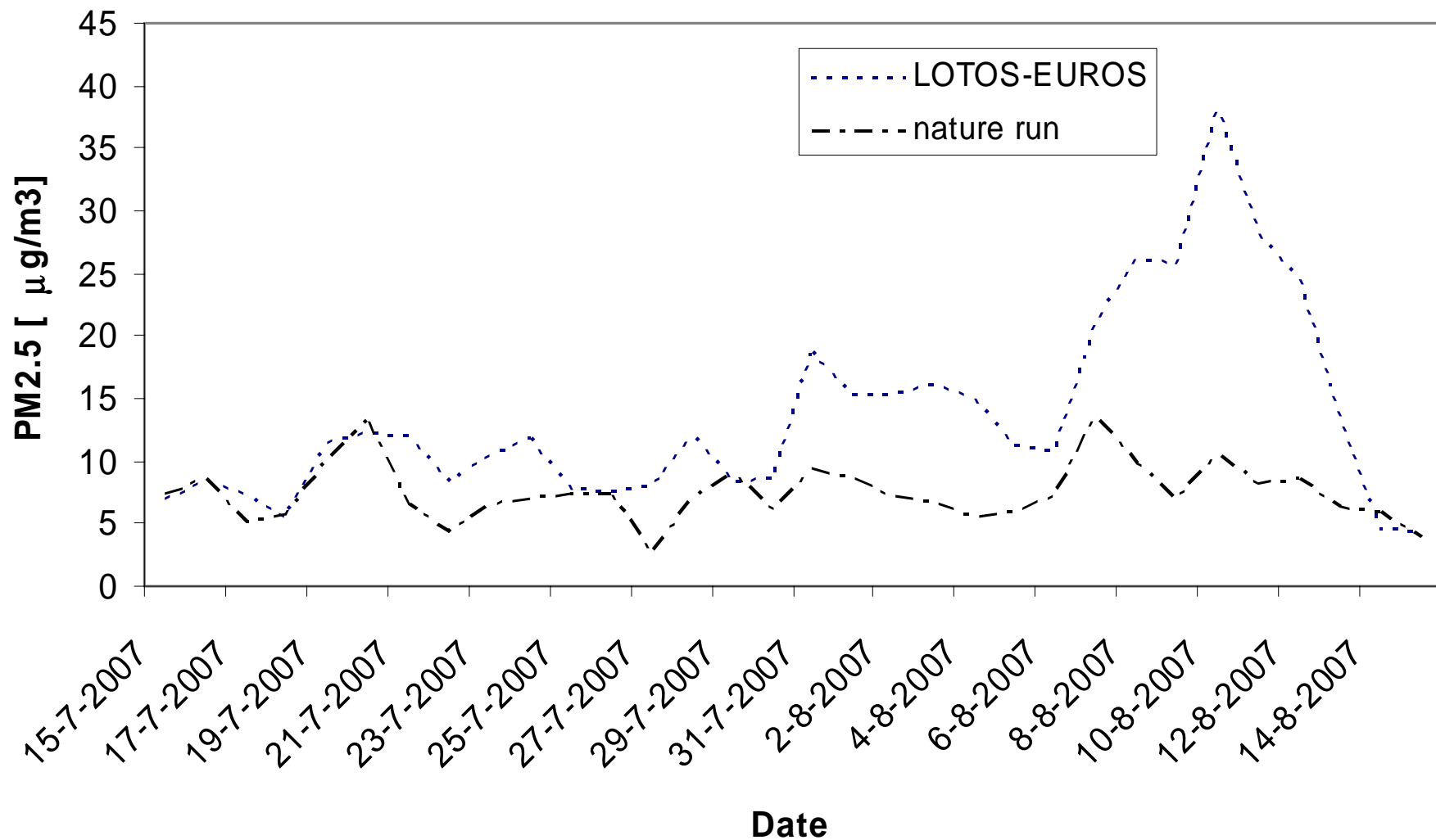


bias



rmse

# Amsterdam



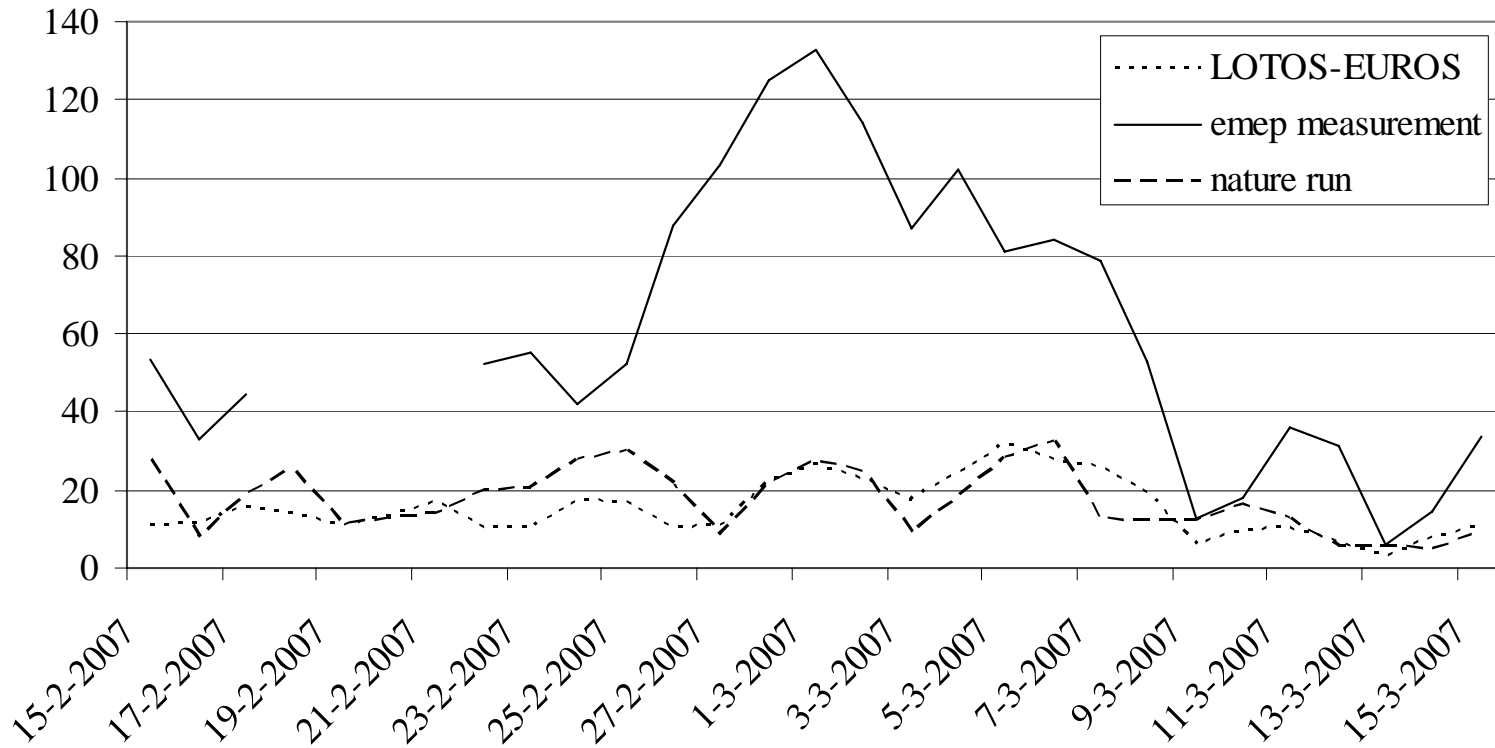
# Bias daily values

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	daily summer	0.70	0.48	0.67	0.73	0.47	0.76	0.93	0.94	<b>0.71</b>
	daily winter	0.72	0.81	0.24	0.56		0.58	0.63	0.60	<b>0.59</b>
RMSE	hourly summer						10.18	12.39	10.53	<b>11.03</b>
	hourly winter						18.77	9.28	10.42	<b>12.82</b>
	daily summer	9.88	7.41	8.69	10.20	11.46	8.88	11.38	9.15	<b>9.63</b>
	daily winter	55.2	44.44	7.75	15.76		16.26	8.09	8.91	<b>22.34</b>
bias	hourly summer						-7.71	-8.87	-7.11	<b>-7.90</b>
	hourly winter						-11.98	-5.48	-5.139	<b>-7.53</b>
	daily summer	-9.06	-6.14	-7.65	-8.48	-8.96	-7.65	-8.99	-7.05	<b>-8.00</b>
	daily winter	-46	-28.45	2.55	-11.87		-11.92	-5.43	-5.09	<b>-15.17</b>

LE vs nature run		AT02	DE02	DE03	DE04	IT04	DE737	GB36	GB617	average
correlation	hourly summer						0.63	0.50	0.36	<b>0.50</b>
	hourly winter						0.59	0.72	0.69	<b>0.67</b>
	daily summer	0.67	0.64	0.68	0.70	0.80	0.82	0.81	0.63	<b>0.72</b>
	daily winter	0.58	0.59	0.69	0.71		0.71	0.83	0.78	<b>0.70</b>
RMSE	hourly summer						5.89	5.25	6.00	<b>5.71</b>
	hourly winter						11.45	7.26	9.35	<b>9.35</b>
	daily summer	2.55	2.46	4.22	3.48	2.25	4.39	3.45	4.61	<b>3.42</b>
	daily winter	7.32	7.09	4.60	7.16		9.83	5.62	7.28	<b>6.98</b>
bias	hourly summer						-3.26	0.39	1.57	<b>-0.43</b>
	hourly winter						-7.06	-2.96	-3.90	<b>-4.64</b>
	daily summer	-1.14	1.20	-1.96	-1.53	1.17	-3.21	0.44	1.64	<b>-0.42</b>
	daily winter	-1.94	-3.13	1.52	-4.71		-7.00	-2.91	-3.85	<b>-3.15</b>



## AT02





# Bias hourly values

LE vs measurements		AT02	DE02	DE03	DE04	IT04	DE737	GB36	GB617	average
correlation	hourly summer						0.55	0.20	0.61	<b>0.46</b>
	hourly winter						0.51	0.46	0.38	<b>0.45</b>
	daily summer	0.70	0.48	0.67	0.73	0.47	0.76	0.93	0.94	<b>0.71</b>
	daily winter	0.72	0.81	0.24	0.56		0.58	0.63	0.60	<b>0.59</b>
RMSE	hourly summer						10.18	12.39	10.53	<b>11.03</b>
	hourly winter						18.77	9.28	10.42	<b>12.82</b>
	daily summer	9.88	7.41	8.69	10.20	11.46	8.88	11.38	9.15	<b>9.63</b>
	daily winter	55.2	44.44	7.75	15.76		16.26	8.09	8.91	<b>22.34</b>
bias	hourly summer						-7.71	-8.87	-7.11	<b>-7.90</b>
	hourly winter						-11.98	-5.48	-5.139	<b>-7.53</b>
	daily summer	-9.06	-6.14	-7.65	-8.48	-8.96	-7.65	-8.99	-7.05	<b>-8.00</b>
	daily winter	-46	-28.45	2.55	-11.87		-11.92	-5.43	-5.09	<b>-15.17</b>

LE vs nature run		AT02	DE02	DE03	DE04	IT04	DE737	GB36	GB617	average
correlation	hourly summer						0.63	0.50	0.36	<b>0.50</b>
	hourly winter						0.59	0.72	0.69	<b>0.67</b>
	daily summer	0.67	0.64	0.68	0.70	0.80	0.82	0.81	0.63	<b>0.72</b>
	daily winter	0.58	0.59	0.69	0.71		0.71	0.83	0.78	<b>0.70</b>
RMSE	hourly summer						5.89	5.25	6.00	<b>5.71</b>
	hourly winter						11.45	7.26	9.35	<b>9.35</b>
	daily summer	2.55	2.46	4.22	3.48	2.25	4.39	3.45	4.61	<b>3.42</b>
	daily winter	7.32	7.09	4.60	7.16		9.83	5.62	7.28	<b>6.98</b>
bias	hourly summer						-3.26	0.39	1.57	<b>-0.43</b>
	hourly winter						-7.06	-2.96	-3.90	<b>-4.64</b>
	daily summer	-1.14	1.20	-1.96	-1.53	1.17	-3.21	0.44	1.64	<b>-0.42</b>
	daily winter	-1.94	-3.13	1.52	-4.71		-7.00	-2.91	-3.85	<b>-3.15</b>



## Conclusion difference LOTOS-EUROS – nature run

- Correlations in same range as with real measurements
- Bias and RMSE lower than compared with real measurements
  - Models underestimate measurements but in 10 years improvements in models

Therefore the current nature run and version of the LOTOS-EUROS model are thought to be appropriate for the purpose of the OSSE.