Exploring the formation and dissipation of radiation fog from observational data and numerical model results (WRF and HARMONIE)

C. Román-Cascón (1), J. Yagüe (2), G. Morales (2), G. J. Steeneveld (3), I. Bartolomé (1), M. Sastre (1), J. A. Arrillaga (1) and G. Maqueda (4)

1. MOTIVATION & INTRODUCTION

NOT CORRECT FOG FORECASTING

FOG PHYSICAL PROCESSES NOT WELL UNDERSTOOD

NOT WELL PARAMETERIZED IN MODELS

PROBLEMS

General fog simulation: a) wrong fog onset (too early), b) wrong fog dissipation (too late), c) wrong fog formation, d) fog intensity overestimated, e) fog duration underestimated, f) fog producing in general slightly wrong values.

Some known problem-models

2. DATA AND METHOD

- Located at an extensive and homogeneous plateau in the Spanish Northern Plateau (Montes Toledo (41°47'N, 4°56'W, 840 m a.s.l)).

- Data from 2 towers (10 m and 100 m).

- Studied period: 19-27 Jan, 2016, composed by several radiation-fog events with different features (thickness, duration, fog formation processes, temperature, etc.).

- Event 3, 23 Jan, 2016: WRF-HARMONIE bias (h) went wrong around 00 UTC.

- Fog formation (cloud-base-forming fog) from low clouds, persistent and thick. WRF - Correct fog formation (cloud-base-forming fog process).

- Fog dissipation occurred several hours during daytime (although more persistent fog than WRF). WRF5105 overestimated.

- Fog still present and dissipated before midday. Shallow and variable thickness. WRF - Correct fog dissipation and observed thickness behavior (although vertical extension overestimated).

- Fog formed during the afternoon (cloud-base-forming fog from low clouds), persistent and thick. WRF - Correct fog formation (cloud-base-forming fog process).

- Fog dissipation occurred several hours during daytime (although more persistent fog than WRF). WRF5105 overestimated.

- Fog formed during the afternoon, increasing thickness and dissipated after sunrise. WRF - Correct simulation (onset and dissipation), although vertical extension overestimated. T2 and W5105 overestimated. HARMONIE - Fog not simulated by the model (correct simulation). Overestimation of wind speed and temperature.

3. RESULTS

- Summary: Analysis of 8-day period in January 2016, composed of 7 fog events with different features at CIBA (Northern Spanish plateau). WRF and HARMONIE simulations are evaluated and compared to the observed fog.

4. CONCLUSIONS

- Models fog-simulation features

- Both models able to simulate almost all fog events.

- Good representation of cloud-base-forming processes.

REFERENCES


