Mediterranean Tropical-like Cyclones



Ernst and Matson (1983), Emanuel (2005), Miglietta et al. (2013), Tous and Romero (2013), Cavicchia et al. (2014)



Qendresa (7-8 Nov. 2014)

MALTA

Pytharoulis et al. (2017) Cioni et al. (2018)







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16:00 Time [UTC]

17:00

18:00

Pytharoulis et al. (2017) Cioni et al. (2018) BenGardane

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Introduction • Experiments • Small Scale • Large Scale • Conclusions

996

994

992

990

988

986

984

982

980

978 – 12:00

(c)

Pressure Wind speed Wind Gust

13:00

14:00

15:00

160

140

120

100 [km h⁻¹] Mind [km h⁻¹]

80

60

40

20

0

20:00

19:00

Predicting the event



Hans-Ertel-Zentrum

Predicting the event



Hans-Ertel-Zentrum

Predicting the event



Hans-Ertel-Zentrum

Is resolution really important to predict these events?



Modelling strategy

- ICON
- 10 km to 300 m grid spacing
- 6 hourly ECMWF-IFS operational analyses as forcing





Resulting tracks





Resulting tracks



Resulting tracks

Conclusions

When **CONVection** is explicitly represented, the simulated trajectory converges to the observed one

The high-resolution simulation

Predictability from the "small" scale

 Low-levels temperature anomaly in a radius of 50 km around the cyclone position during the intensification phase

Convection-permitting simulations do not produce a warm core

für Wetterforschung

From the "small" to the "large" scale

in a 50 km

the cyclone

position

$$\frac{\partial \Pi}{\partial t} \propto \frac{\partial}{\partial z} \left(\frac{\partial \theta_{\rm rad}}{\partial t} + \frac{\partial \theta_{\rm cond}}{\partial t} \right)$$

 Stronger dipole of PV with higher resolution (resolved convection)

Predictability from the large scale

Geopotential height @ 500 hPa (grey shadings) and Potential Vorticity @ 350 hPa (black contours, only 3,5,7 PVU isolines shown)

- PV maximum above the cyclone appears only with poorly resolved convection
- Different PV distribution modifies the atmospheric state and the cyclone evolution

Questions?

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E.E.

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