Assessment of atmospheric stability measurements from microwave radiometer observations for wind energy applications

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PROBE
COST
ACTION

C2WIND

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Institute of Methodologies for Environmental Analysis

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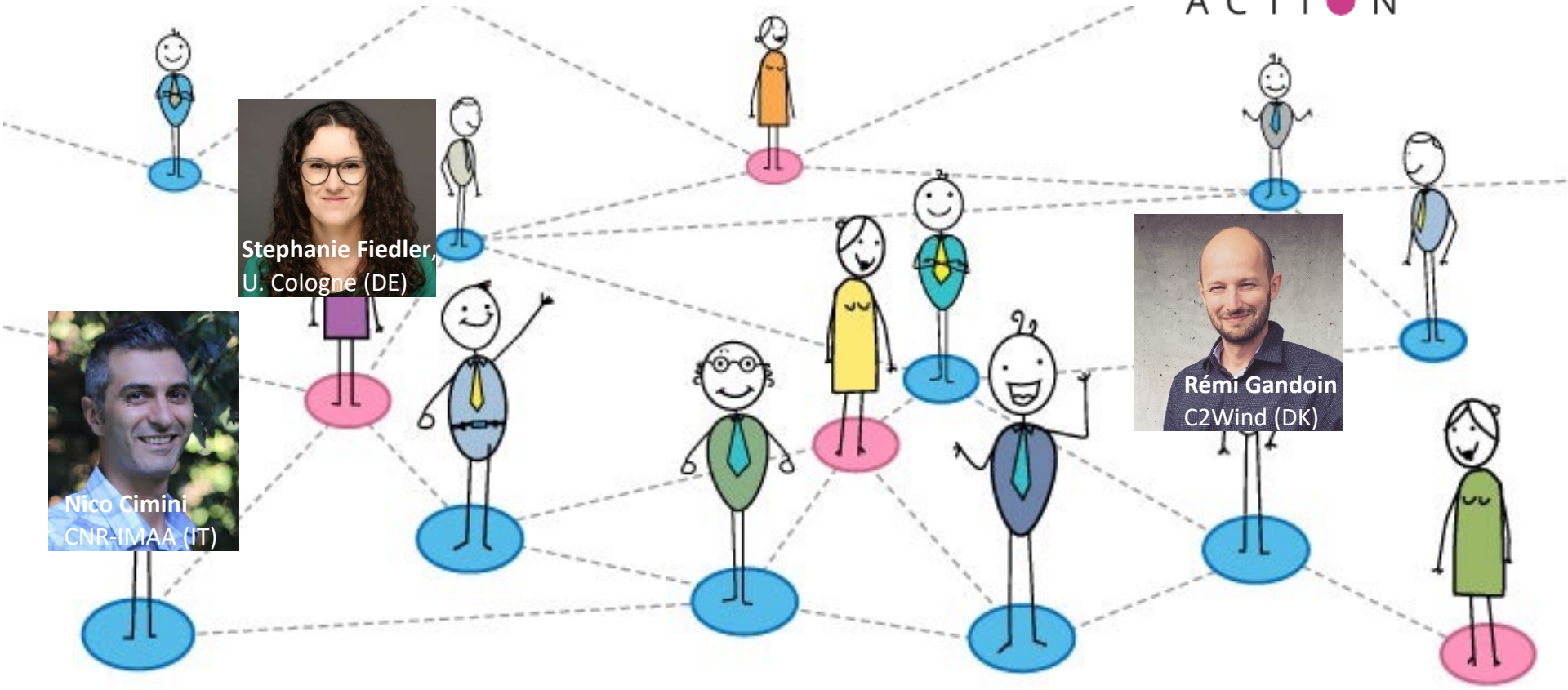
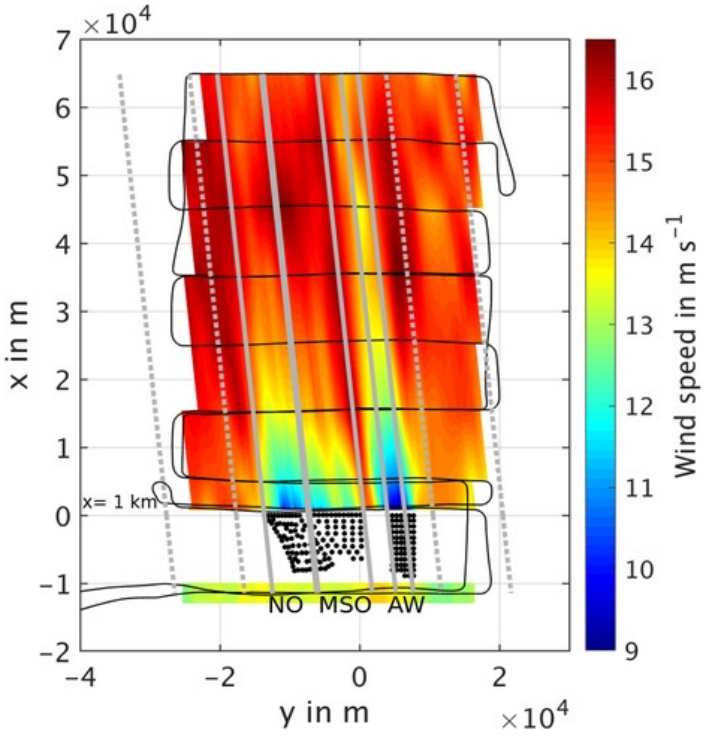
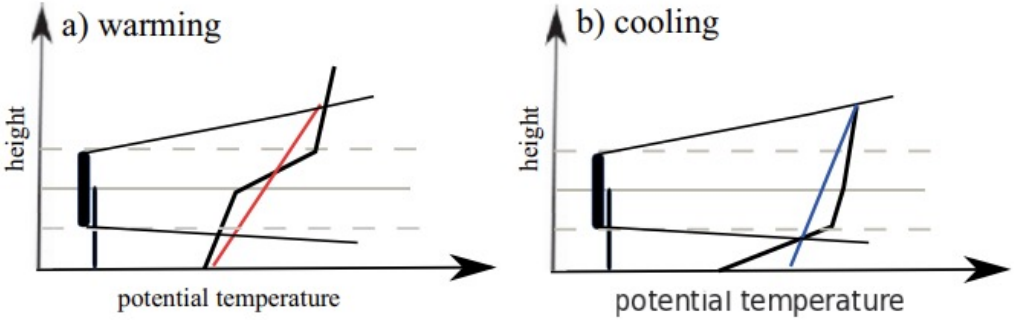
PROBE successful story



Atmospheric stability



Platis et al., 2020 – doi: 10.1002/we.2568



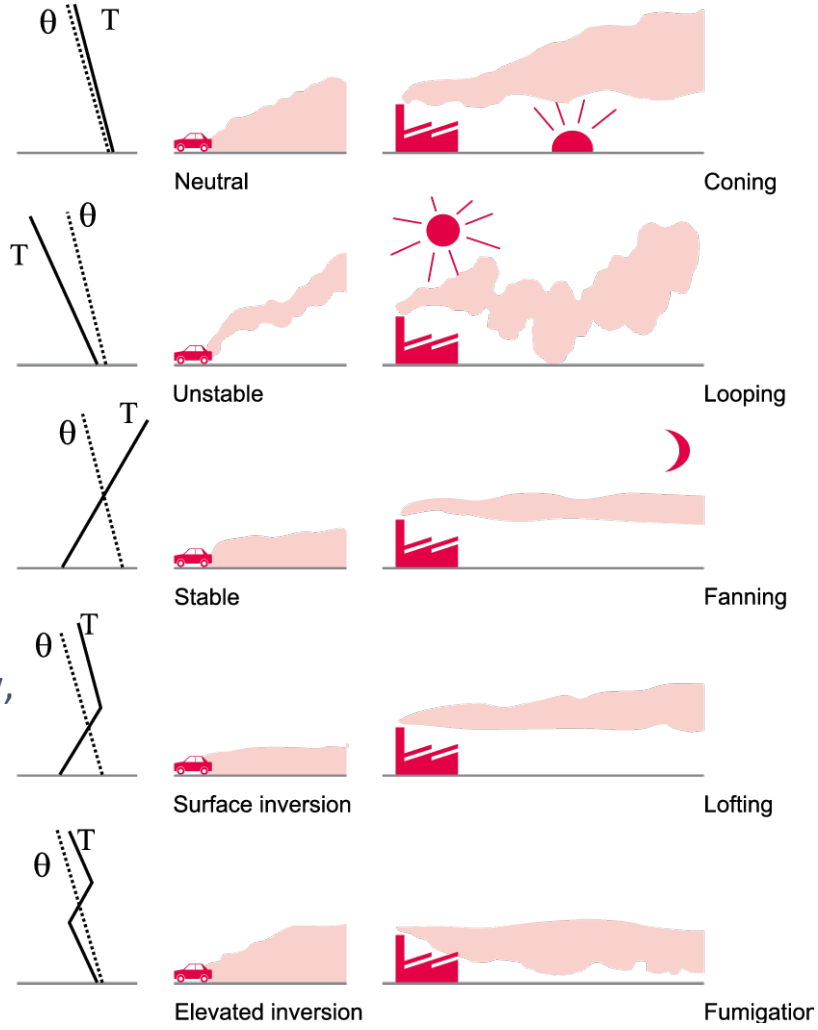
Siedersleben et al 2018, doi: 10.1088/1748-9326/aaea0b

weak lapse conditions

strong lapse conditions

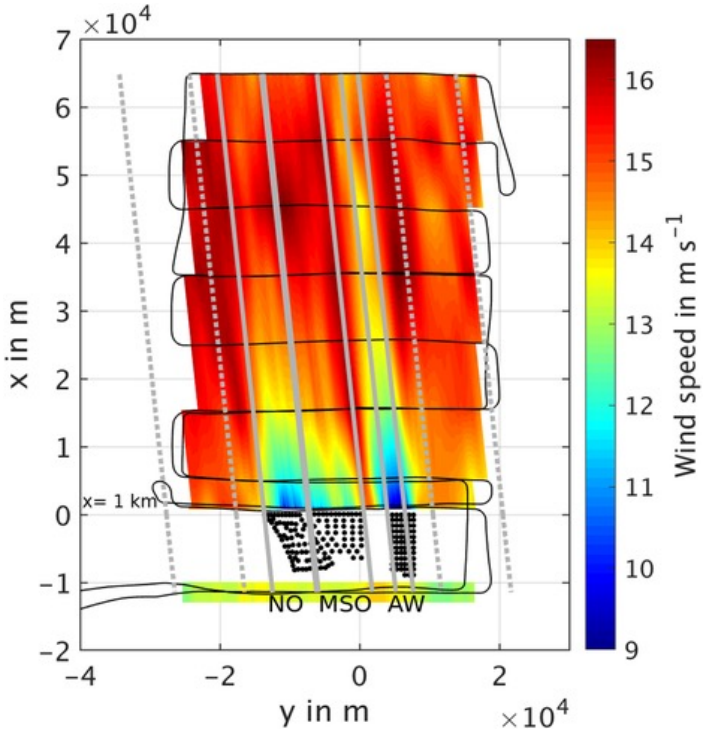
temperature inversion

inversion below, lapse aloft



Stull, ISBN: 978-94-009-3027-8

Atmospheric stability



Platis et al., 2020 – doi: 10.1002/we.2568

5.2 Additional measurement requirements and stability measures for the marine BL

For future estimations of wind park power output and for improving analyses of offshore wind park wakes, a crucial parameter was found to be profiles of temperature and the stability parameter. Temperature inversions occur at different altitudes above, below and within the rotor area. A near-surface, predominantly convective layer

CARBON TRUST

- Off-shore Wind Accelerator program

- Call for a scoping study:
  - Radiometry and Atmospheric Profiling

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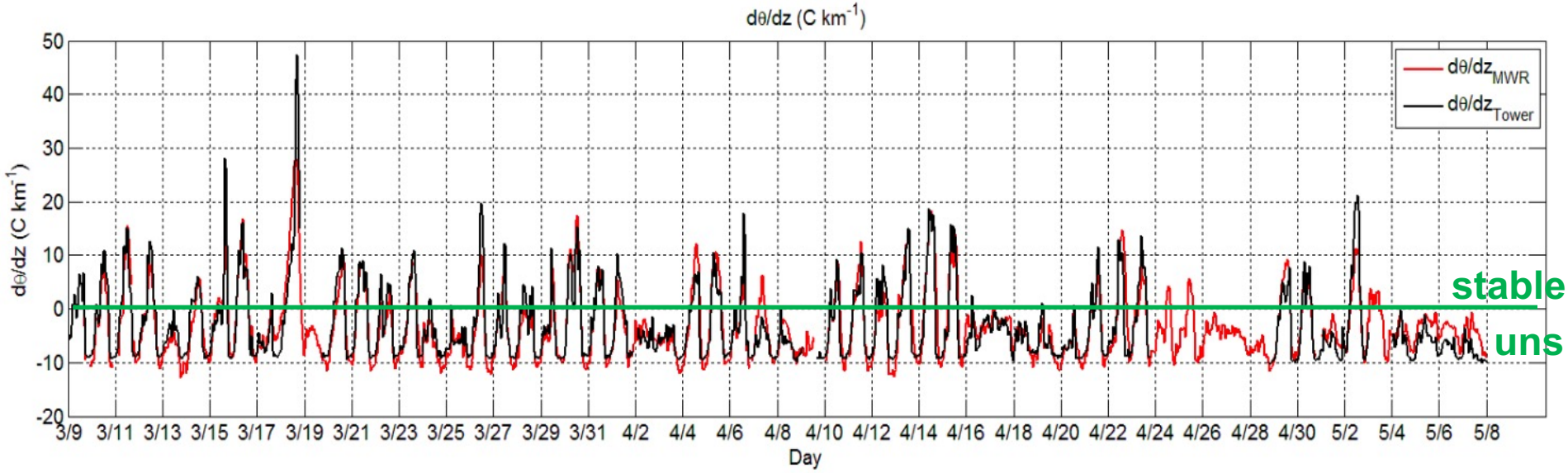
- **Aims:**
  - Review the modeling capability
  - Design a field experiment
  - Assess MWR capability to estimate θ gradients for on/off-shore conditions

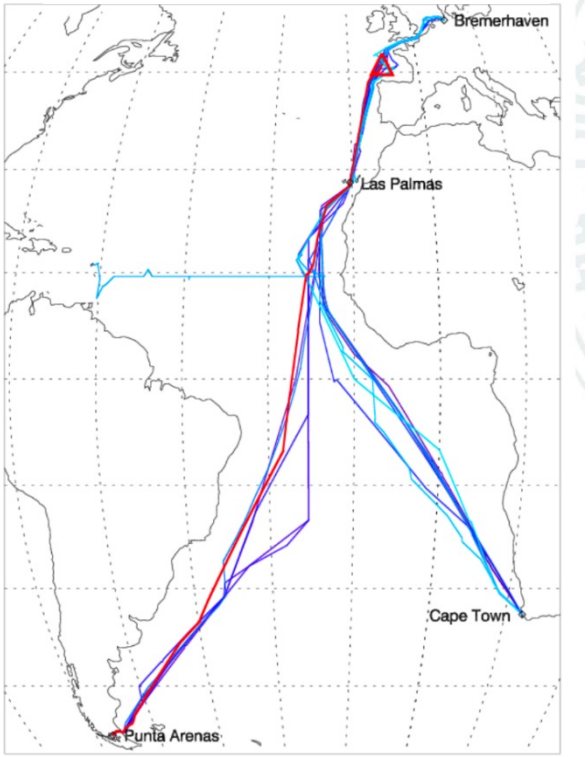
Potential temperature gradients

- Assessment on a mountain site: BAO, CO, USA (Bianco et al., 2017)



Datasets in different climatology

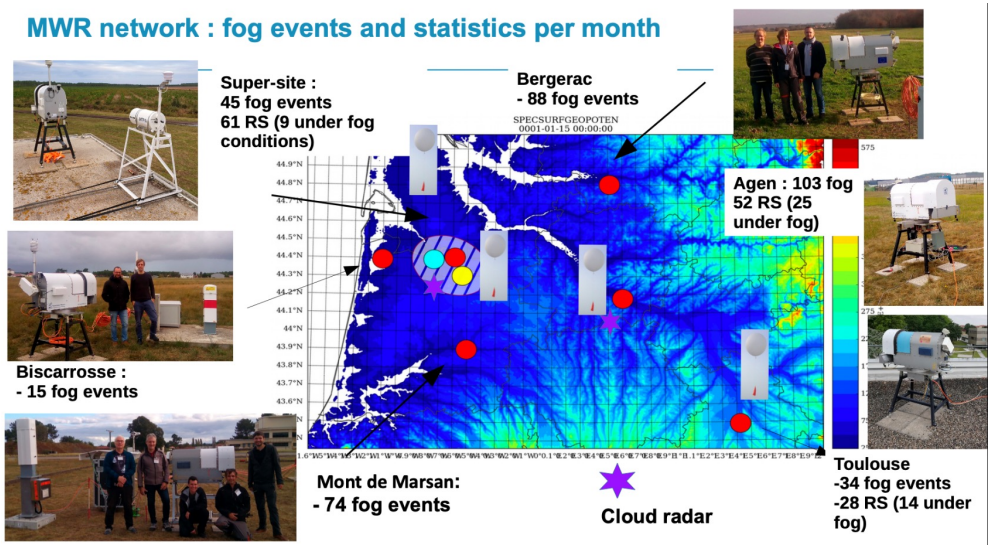
Polarstern RV cruises (open ocean)



Data from Bernhard Pospichal (U. Köln)

ARM site Graciosa Island (marine)

SOFOG3D experiment (rural)

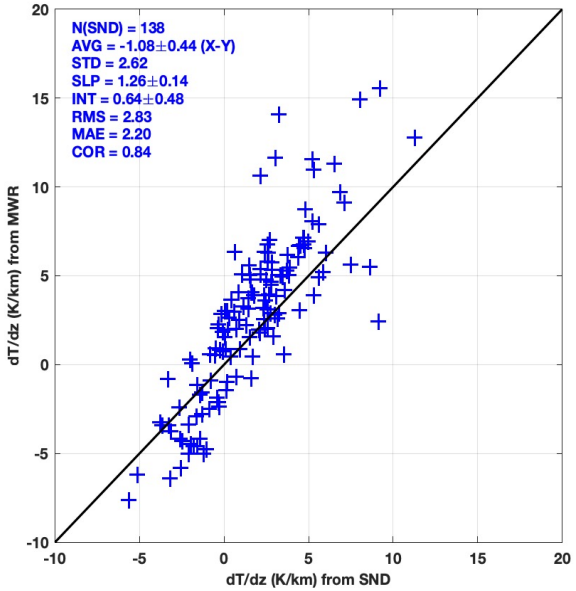


Data from Pauline Martinet (MeteoFrance)

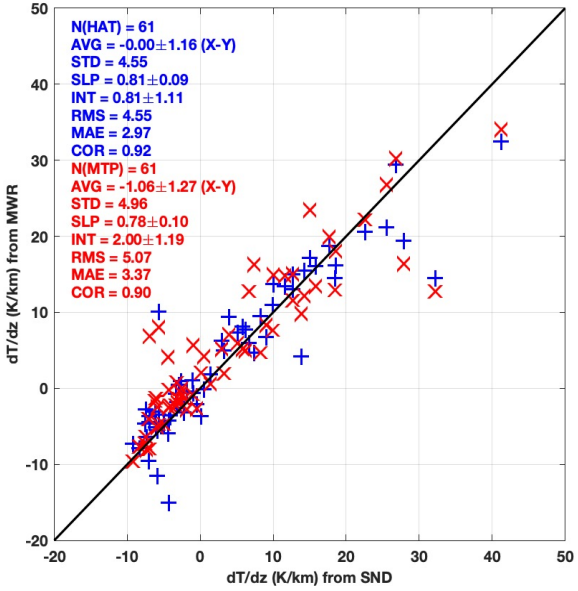
Assessment of MWR capability to measure θ gradients

- Scatter plots of MWR vs radiosonde θ gradients

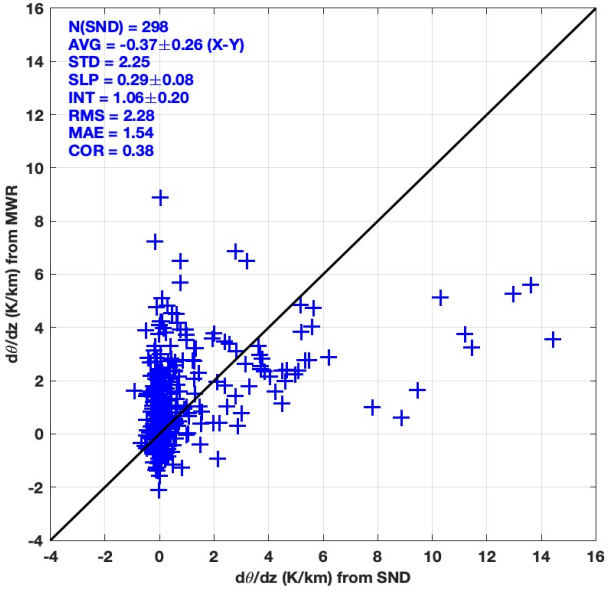
Graciosa (marine)



SOFOG3D (rural)



Polarstern RV (open ocean)



- **Main conclusions:**
  - Performances mostly independent from climatology (mountain, rural, marine)
    - MAE ~2 K/km, Corr. >0.8
  - Polarstern RV dataset (open ocean) show lower performances
    - MAE ~2 K/km, Corr. ~0.4
  - Possible reason: Inadequate training dataset

Thanks much for the attention!