Introduction to Component A - international perspectives and main results

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Introduction to Component A – international perspectives and main results

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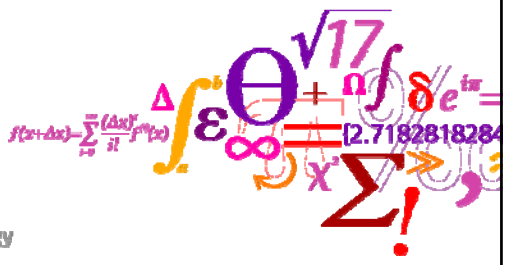


Risø DTU
National Laboratory for Sustainable Energy

Mesoscale and microscale modelling in NE China

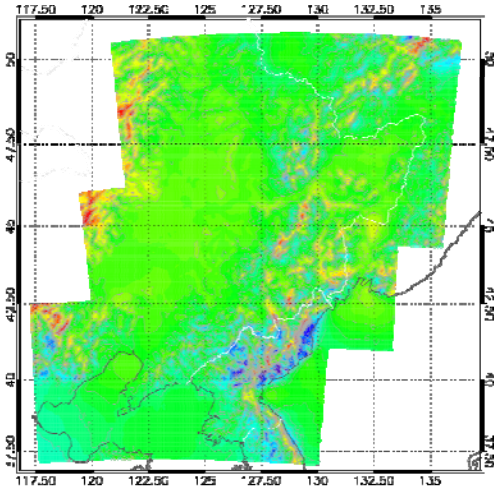
- Funded by the "Sino-Danish Wind Energy Development Programme – WED"
- Project focuses on Dongbei
- Project period 2008-2010

- Wind resource assessment in Dongbei
  - Measurements
  - Microscale modelling
  - Mesoscale modelling
  - Application

- Project emphasis
  - research and development
  - measurement practices
  - numerical wind atlas methodologies
  - verification and uncertainties
  - application aspects for wind energy planning and project preparation

Dongbei

Project A01 – Mesoscale modelling



Project A01 – Mesoscale modelling

Summary and achievements

- Numerical wind atlases have been calculated for Dongbei using Risø DTU's KAMM/WAsP and CMA's WERAS (WRF).
- Wind classification system developed for Dongbei
- Verification method used with KAMM/WAsP and WERAS
- Sensitivity and uncertainty assessed
- Comprehensive model-derived datasets created for users application

Main conclusions

- KAMM/WAsP mean absolute error evaluated to be 10%
- WERAS (WRF) requires modified verification method for optimal use
- Risø DTU's and CMA's method comparisons and the sensitivity analysis have given better understanding of important model parameters and meteorological conditions influencing wind resources.

Main recommendations

- Methods to pass WRF simulation results into WAsP need to be improved
- Research required to link sensitivity to model uncertainties
- Continue measurements at current sites for multi-year assessment

Project A02 – Measurements

Project A02 – Measurements

Summary

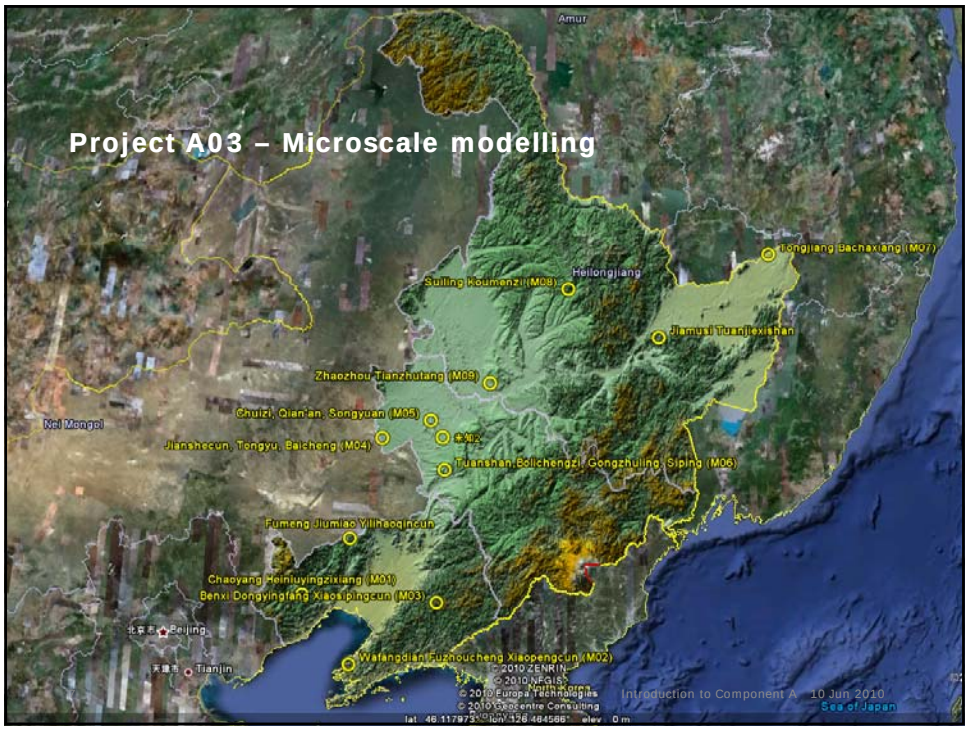
- Twelve 70-m meteorological stations are in operation
- Databases of measurements available for one full year (2009)
- Risø DTU and CMA instrumentations have been compared

Main conclusions

- Measurement uncertainty lower with P2546A setup
- Mast instrumentation training successful

Main recommendations

- Follow international standards for high-quality measurements
  - Top-mounted anemometer
  - Select boom directions carefully and mount anemometers on poles
  - Sensor quality and calibrations should refer to traceable wind tunnels
- Data acquisition memory redundancy to get >95% data recovery and continuous surveillance.



Project A03 – Microscale modelling

Summary

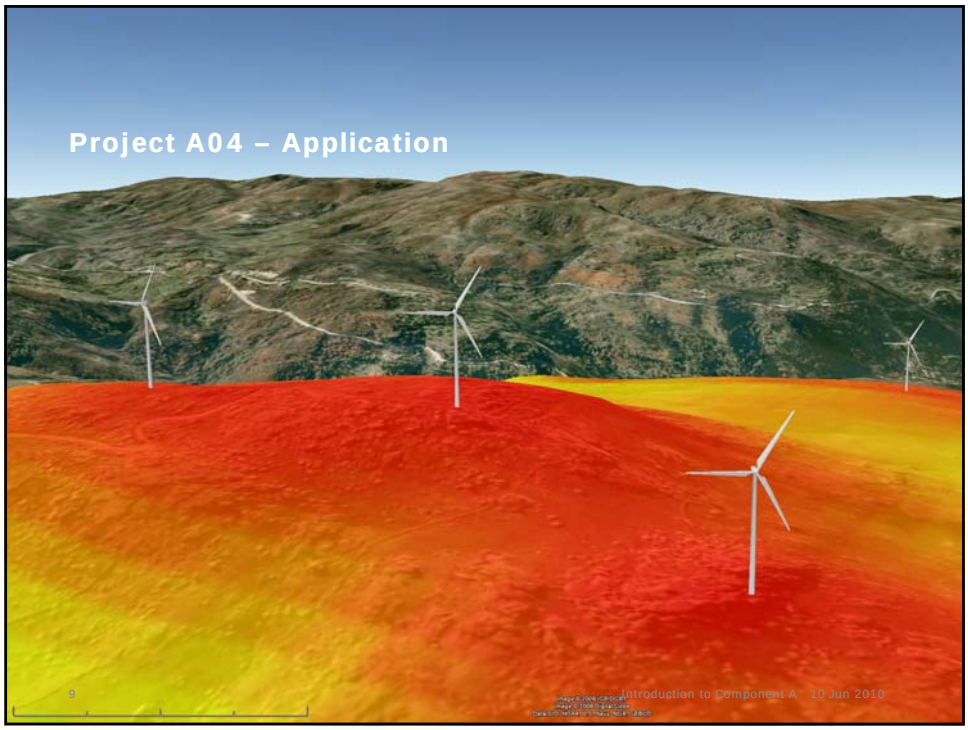
- Observational wind atlas for 12 sites in Dongbei has been established
- WAsP modelling has been verified by comparison to measurements
- Sensitivity analyses and uncertainty estimation has been studied

Main conclusions

- WAsP generally works well in Dongbei!
  - Default modelling parameters work well for most sites
  - Modelling can be improved slightly by a few model adaptations
  - Hilly and very steep sites with forest are less well modelled

Main recommendations

- Compare wind atlas to nearby long-term data
- Update observational wind atlas every year!



Project A04 – Applications

Summary

- Wind atlas databases available for planning and project development
- Wind atlas databases will be available from public web site at CMA
- Wind atlas useful for resource assessment and design of wind turbines
- 3 case studies using the Wind Atlas compared with observations

Main conclusions

- Bankability of wind farm projects requires on-site measurements

Recommendations

- Use sensitivity analyses for uncertainty assessment
- Additional uncertainties, such as inter-annual variations and large-scale wind farm effects, should be taken into account.
- Component A masts should remain operational as reference masts
- Update NWA every year with improved verification
- Courses in application of the wind atlas and correct use of database