

Comparison of MODIS and SWAT evapotranspiration over complex terrain at different spatial scales

Lanre Abiodun

Professor Okke Batelaan

Associate Professor Huade Guan

Dr Vincent Post

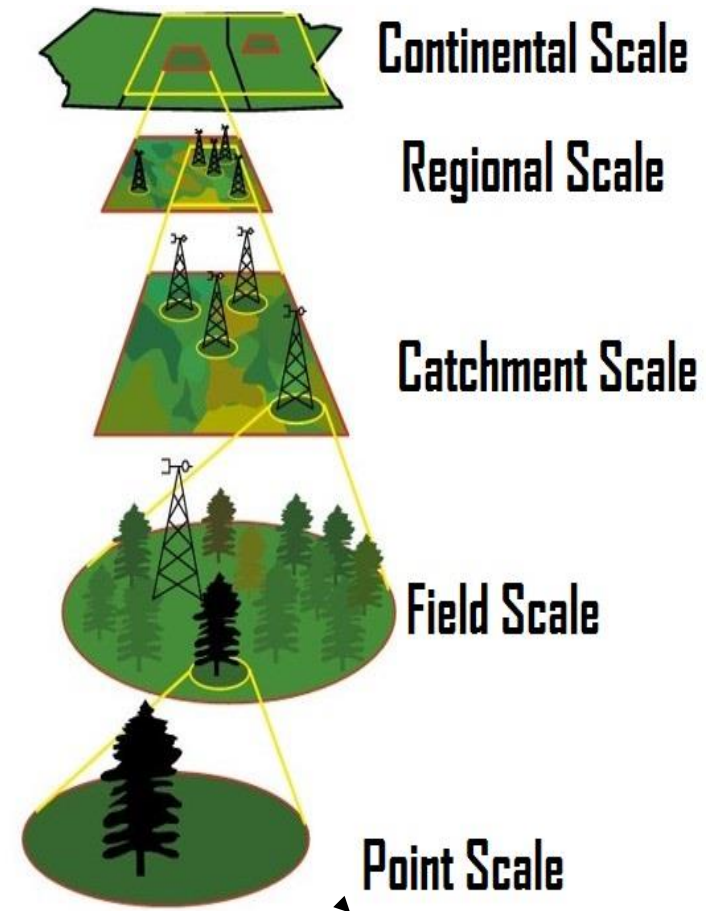


Flinders
UNIVERSITY

inspiring achievement

ET Facts

- ET is difficult to measure accurately
- Two principal methods of ET estimation – Ground based and models
- Current ground based ET methods are expensive and offer poor catchment/ regional scale estimates

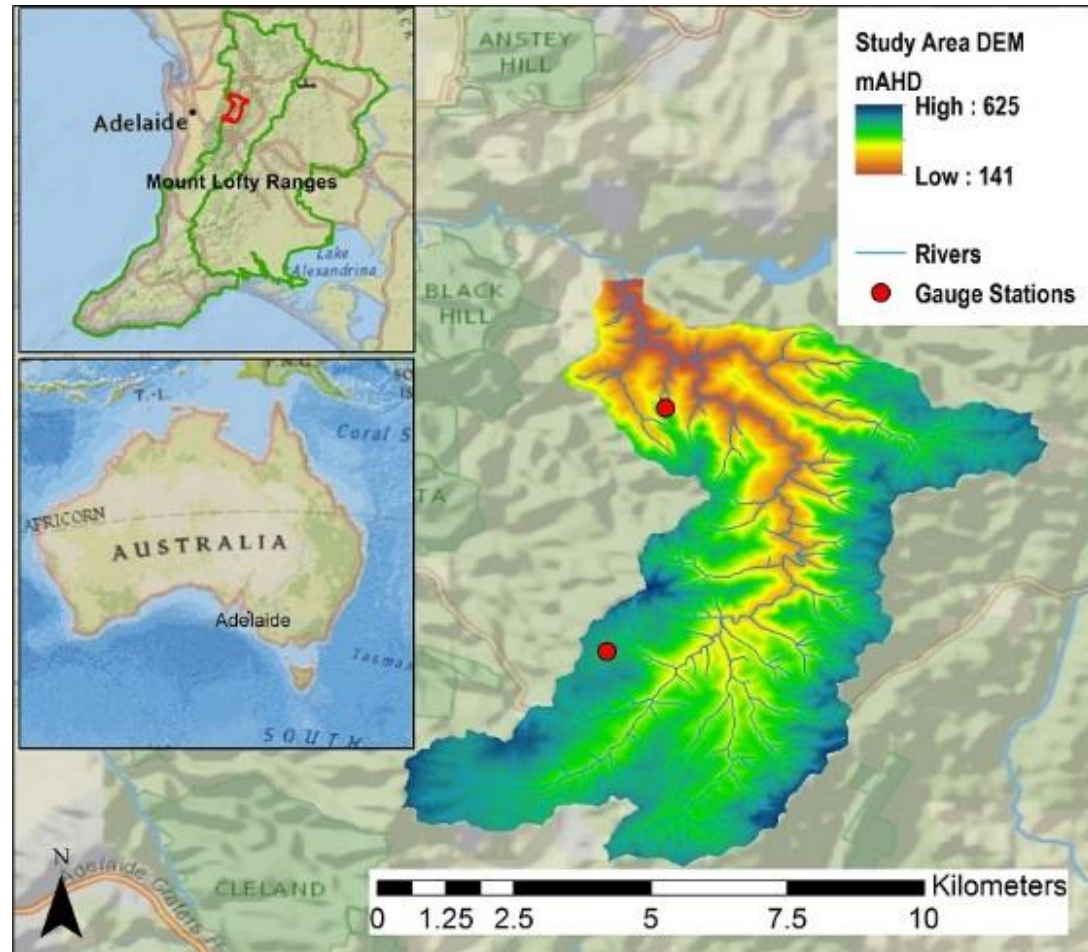


This Study

- Two models – Hydrological (SWAT) and Energy balance based model (MOD16) in a complex terrain
- We analyse the results to determine spatio-temporal correlations
- Determine the drivers of ET in the models

Study Area

- The Sixth Creek Catchment of the Western Mount Lofty Ranges (44 km²)
- Complex rolling terrain with highly varied rainfall events



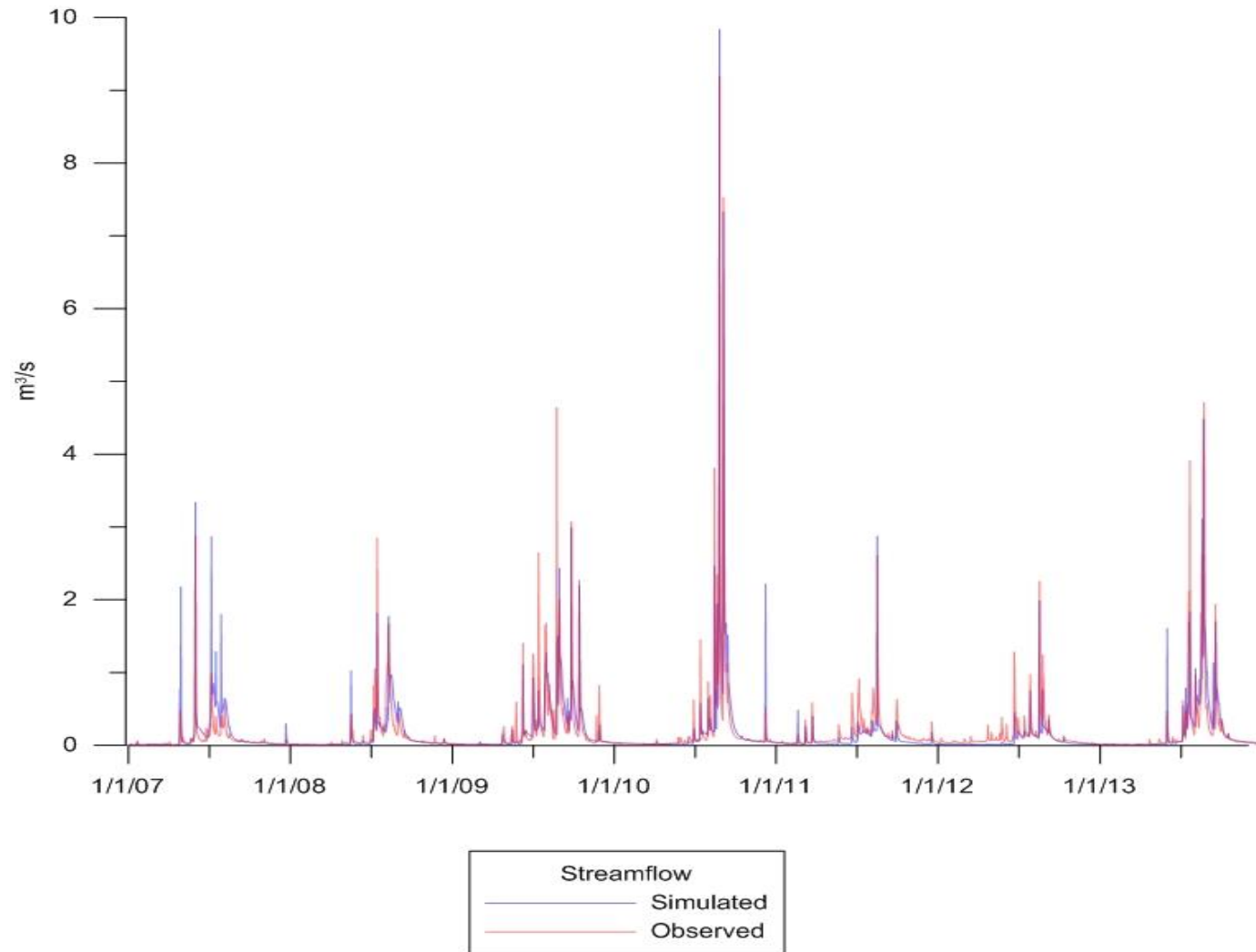
Geoscience Australia (2015)

Methodology

- Create a catchment hydrological model for the Sixth Creek in SWAT
- Extract the residual simulated ET and process into monthly 1km² grids
- The SWAT ET were analysed alongside publically available MOD16 data from NASA

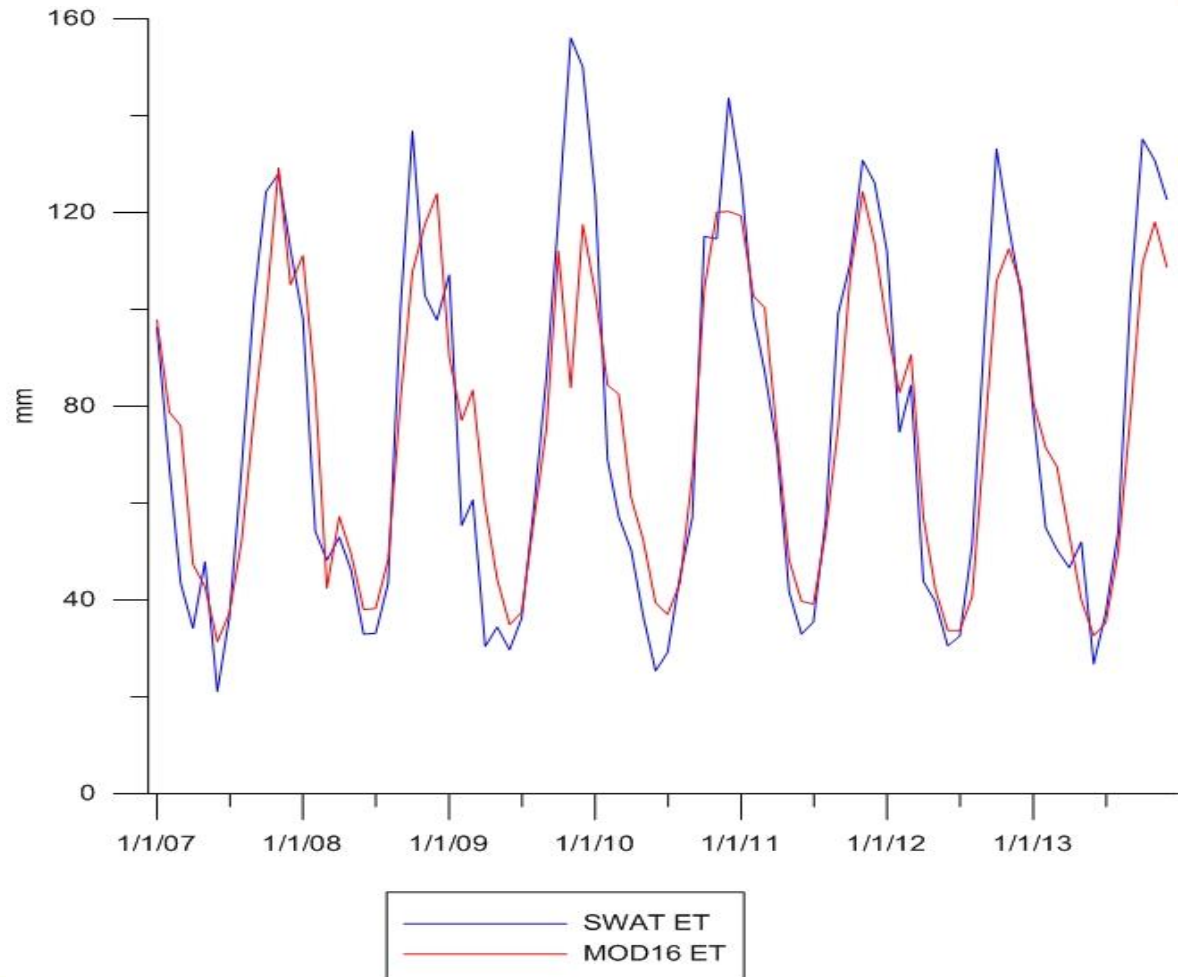
Stream flow validation results (2007 – 2013)

Metric	Value
NSE	0.78
R ²	0.78
Pbias	6.3
KGE	0.86



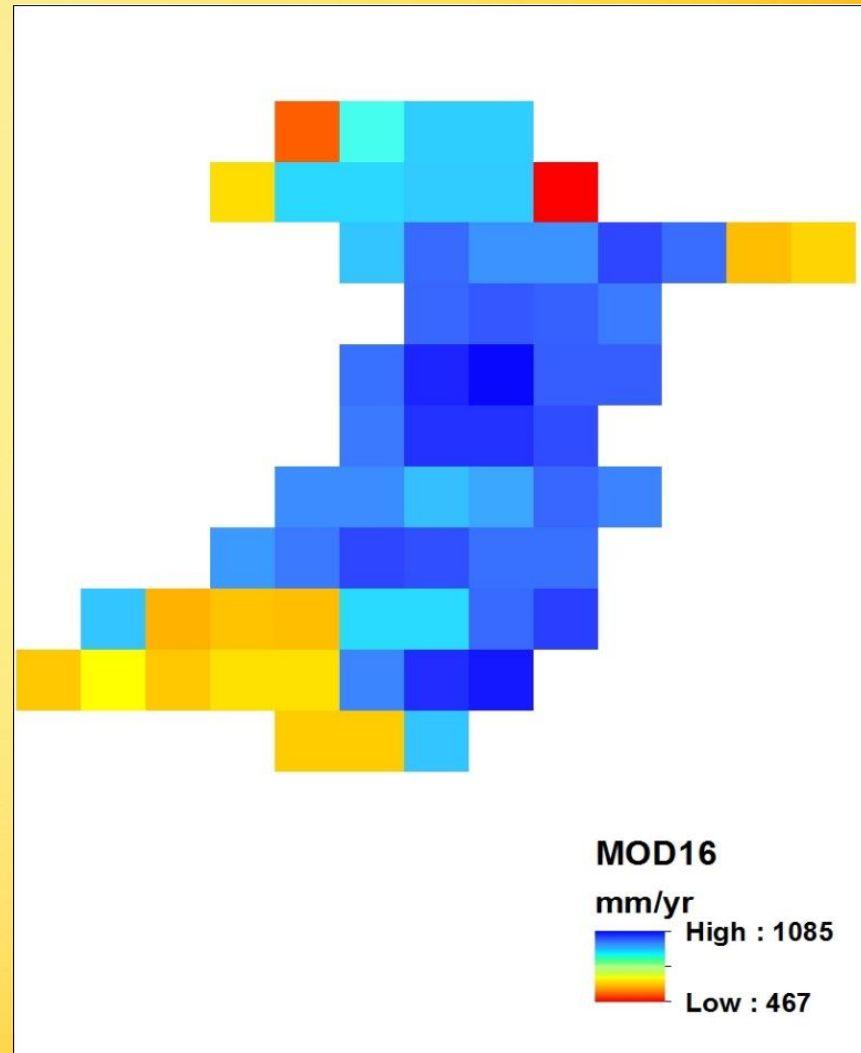
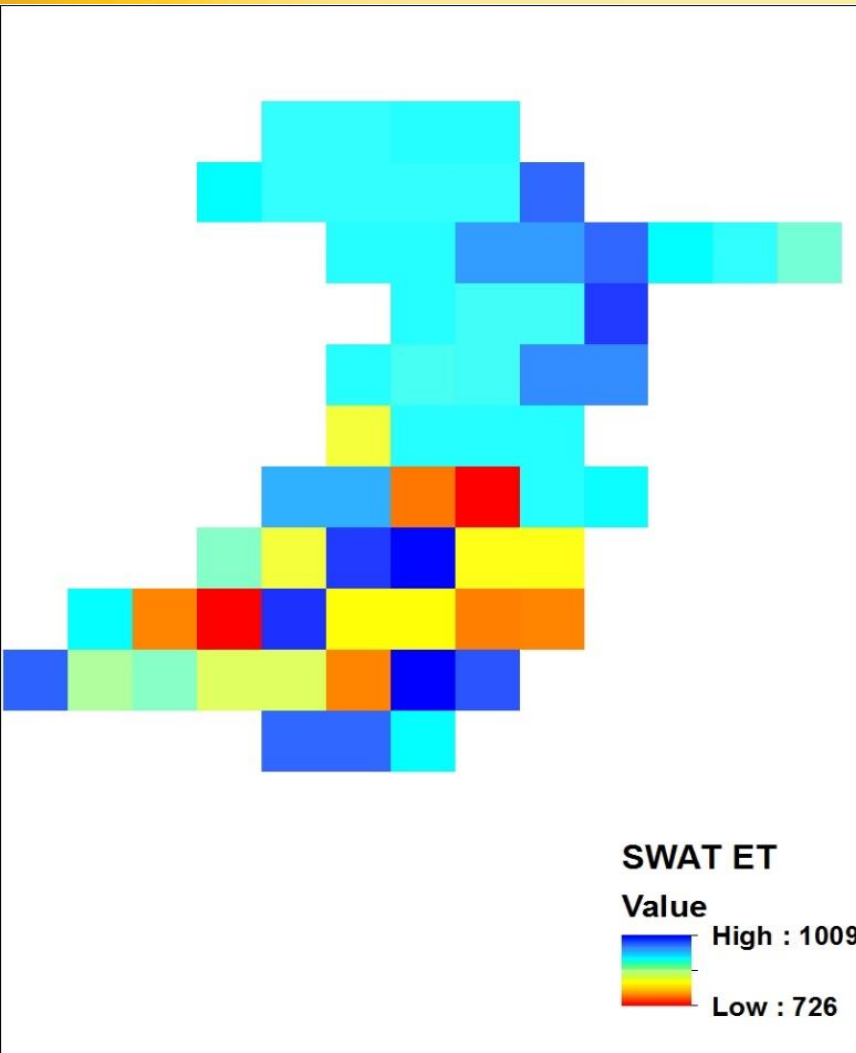
ET Catchment Scale (2007 -2013)

Metric	Mm/month
RMSE	16.5
R ²	0.82
CORREL	0.90
MD	0.78



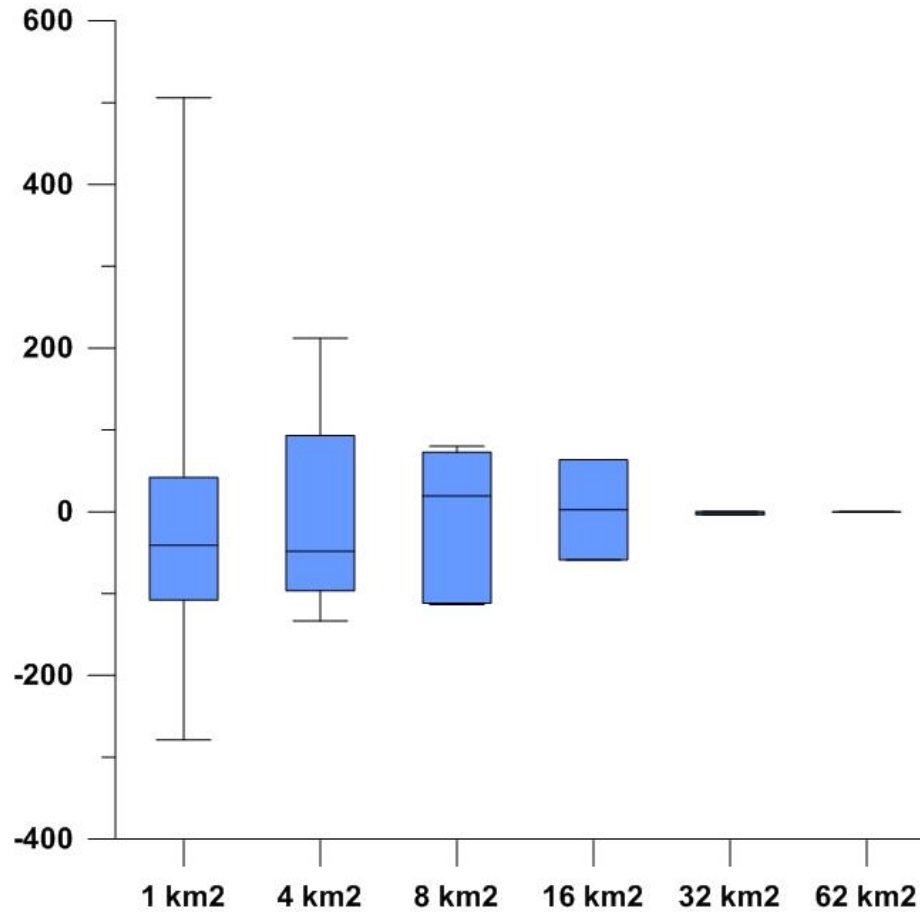
Spatio-temporal Comparison

SWAT & MOD16 SPATIAL ET AVERAGE (2007 – 2013)



Spatial Analysis

SWAT ET – MOD16 ET (Cells aggregation mean 2007- 2013)



Findings

- The two products were within 8% of each other on catchment scale annually
- Up to 56%, 16% and 6% differences at 1km², 4km² and 16km² spatial resolutions
- Biome mismatch were responsible for poor correlation in specific areas

Findings

- Catchment scale averaging of input climate data in SWAT affected correlation at higher resolution
- The models agreed reasonably well regardless of the complex terrain
- The study suggests groundwater ET may be a significant catchment process

Conclusion

- The results suggest that ET models can be reasonably reliable at the 4 km² spatial resolution
- Fine spatial resolution ET products (1 km² and below) should be used in studies with discretion

Further Study

- Eddy Covariance (EC) Method

VS

Maximum Entropy Production (MEP) Method





Flinders
UNIVERSITY

inspiring achievement