Key Eco-Hydrological Parameters Retrieval and Land Data Assimilation System Development in a Typical Inland River Basin of China’s Arid Region

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Multi-annual data products on turbulent heat fluxes at the local and continental scale using AATSR and FY-2 data

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From local to meso-scale

**Frequency**
- ~30’
- 1-2 weeks
- Occasional

**Spatial scale**
- Local footprint
- Kilometric
- Meso

**Data Sources**
- **Gnd Meas.**
  - $R_n$, $LE$, $H$
- **SEBS**
  - $Ef$, $LE$, $H$
- **SEB model**
  - $Ef$, $LE$, $H$
- **Helio. sat.**
  - Alb., $f_c$, LAI
- **Airborne**
  - Alb., LST, LIDAR
- **Geosta. Sat.**
  - NWPM
  - $Ta$, $q$, $u$, $d$, $p$

**Cloud cover**
3-D heterogeneity of water flux

The Heihe Watershed Allied Telemetry Experimental Research
Land cover, surface wetness and temperature
Algorithms development from very high to medium resolution

Digital Surface Model from airborne LIDAR

AATSR

WIDAS
AATSR heat fluxes: Validation with Large Aperture Scintillometer

Large Aperture Scintillometry is the only experimental technique for the validation of heat fluxes at the AATSR spatial resolution.
Mapping aerodynamic roughness

Vegetation height

2m wind speed

z0 from profile inversion

Wind flow (at 2m) over vegetation height map from LIDAR measurements

(Colin and Faivre, 2010)
Higher surface temperature is observed at nadir view than at off-nadir view indicating anisotropy of the thermal emittance of the land surface.

Clear separation between soil and vegetation component temperatures.
- Surface Energy Balance Index (Menenti and Choudhury, 1993) Calculation of the extreme boundaries following the SEBS approach (Su, 2000)
- Stability functions calculated at grid size of 10.PBL height (reduces computation time since fewer loops on solvers)
- Expected results:
  - 1/5km resolution Surface Energy Balance components
  - Time series on a week to 10 days basis
  - Automated processing chain, including interface with data providers & results repositories

Meso-scale Atmospheric Forcing grid [15-100 km]
- $T_a$, $q$, $u$, $v$, $p$
- $S_w$, $L_w$ incoming radiance

ABL Calculation grid [10 x ABL height]

Full resolution calculation grid [TIR Resolution]
- $LST$, albedo, $fc$, LAI, emissivity, DEM
The Numerical Weather Prediction Model GRAPES (CMA, China) is used to characterize air temperature, humidity and wind speed at the top of the Planetary Boundary Layer.
Step 4: Construct Atmo DB

CMA
GRAPES
atmospheric fields
Ingest radiative forcing

Rsi  Rli  Rn
Rso  Rlo  Rn_av

QA
Feng Yun -2C LST: Frequency of gaps

Time series analysis and gap filling LST records
Removing positive and negative outliers and filling gaps

Outliers removal capability and gap-filling using M-SSA in LST time series

Reconstruction of time series LST before and after outliers removal
Evaluation vs. ground measurements

Lake fingerprint?
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Data system operational at Institute Tibetan Plateau Research, Beijing

New algorithms developed and applied for several hydrological observations

Most hydrological data sets 2008 – 2010 produced and available on data system

Distributed hydrological model Plateau and headwaters main rivers S and E Asia developed, evaluation in progress

Trans-boundary water transfers downstream of Plateau evaluated (Bangladesh, India, Pakistan..)

Advanced training courses Beijing 2010, Rourkela 2011

125 team Members

75 MSc and 85 PhD students active in the framework of the project