

Figure 10 Annual changes in fraction of photosynthetically active radiation absorbed by vegetation canopies (FPAR) and leaf area index (LAI) derived from MODIS data at five validation sites

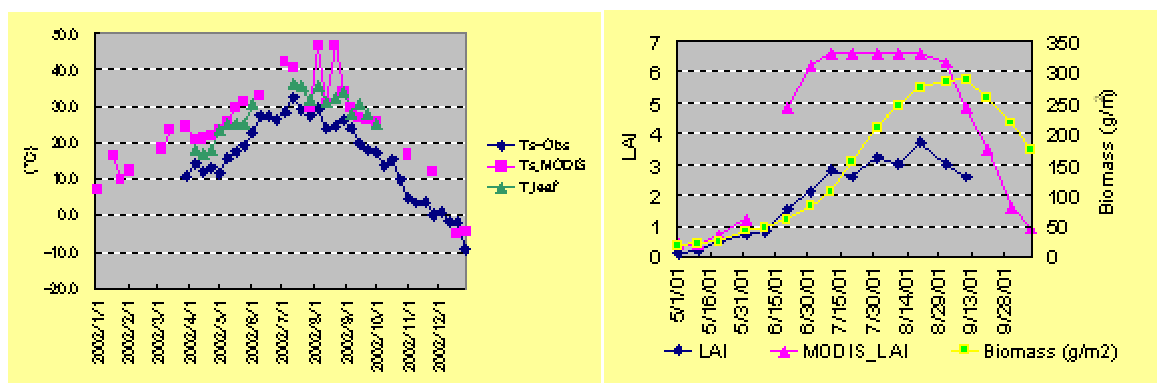


Figure 11 Comparison between observed land surface temperature (left: Yucheng site), and leaf area index (LAI) (right: Haibei Site) with MODIS products in 2001

2.4.3 Development of a ground-truth observation network for various ecosystem types

To validate satellite remote-sensing data, in 2002 we established a ground-truth observation network through which long-term measurements of water vapor, energy exchange, and carbon dioxide from a variety of ecosystems – at Haibei (grassland), Yucheng (irrigated fields), Taoyuan (paddy fields), Qianyanzhou (forest), and Fukang (desert, in China – are measured and integrated into a consistent, quality-assured, and documented dataset. The dataset includes micrometeorological factors, eddy covariance fluxes, vegetation characteristics, and soil physical and chemical properties (Table 1).

Table 1 Types of dataset measurements taken at four ground-truth monitoring stations in China

Validation site:	Yucheng Station (irrigated field)	Taoyuan Station (paddy field)	Fukang Station (Desert)	Haibei Station (grassland)
Location:	Lat 36.95°N, long 116.60°E, 20 m	Lat 28.92°N, long 111.50°E, 20 m	Lat 43.75°N, long 87.75°E, 1600 m	Lat 37.48°N, long 101.20°E, 3200 m
Vegetation characteristics:	Type: crops Fetch: 300–500 m Dominant species: wheat, corn Canopy height: 1–2 m Diameter: 0–5 mm Age: 1 y LAI: 0–4	Type: crops Fetch: 300–500 m Dominant species: rice Canopy height: 1 m Diameter: 0–5 mm Age: 1 y LAI: 0–4	Type: crops Fetch: 300–800 m Dominant species: shrubs Canopy height: 1–3 m Diameter: 0–50 mm Age: many years LAI: 0–2	Type: crops Fetch: 500–2000 m Dominant species: grass Canopy height: 1 m Diameter: 0–3 mm Age: 1 y LAI: 0–6
Observation period:	Test: from October 2001 Monitoring: from April 2002	Test: from February 2002 Monitoring: from April 2002	Test: from February 2002 Monitoring: from April 2002	Test: from August 2001 Monitoring: from April 2002
Infrastructure:	Tower: 7 m (flux and meteorological site) Electricity: 220 V AC Communication: phone and e-mail	Tower: 3 m (flux and meteorological site) Electricity: 220 V AC Communication: phone and e-mail	Electricity: 220 V AC	Tower: 2.5 m (flux and meteorological site) Electricity: 220 V AC
Observed items:	Radiation factors: global radiation, reflected solar radiation, PAR, downward long-wave radiation, upward long-wave radiation, net radiation Meteorological factors: wind speed, wind direction, air temperature, humidity, precipitation, surface temperature, soil temperature, soil heat flux, sensible heat flux, latent heat flux, atmospheric pressure, soil moisture, evaporation, transpiration,			
Eddy correlation method:	CO₂ and H₂O analysis: open-path method; Wind speed, friction velocity, temperature fluctuation: 3-D sonic anemometer – thermometer; Sampling: frequency of 10 Hz and averaging time of 30 min; Data: All data are recorded on a data-logger; Data analysis method: coordinate rotation, line averaging, sensor separation, humidity effect, air density			
Vegetation factors:	Photosynthesis, coverage, leaf area index, biomass, leaf conductance, root density, soil nutrients, salinity			
Data recording method:	Recording data: All data are recorded on a data-logger Archiving method: Data can be downloaded through telecommunication.			