Data comparison between Meiliangwan (MLW) and Dapukou (DPK) in Lake Taihu

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Outline

1. Background
2. Data
3. Comparison analysis
4. Conclusion
5. Discussion
1. Background
EC and microclimate measurement at MLW

- AC
- Datalogger
- Rain gauge
- Water temp
- Microclimate
- EC
- CNR 4 Net Radiometer

Xiao, 2010
EC and microclimate measurement at DPK

Wind Speed and Direction

Temp and Humidity

Rain Gauge

Data Logger

Solar Power

CNR 4 Net Radiometer

Water Temp
## 2. Data

<table>
<thead>
<tr>
<th></th>
<th>MLW</th>
<th>DPK</th>
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</thead>
<tbody>
<tr>
<td><strong>Eddy Covariance measurement</strong></td>
<td>June 13, 2010~now</td>
<td>August 17, 2011~now</td>
</tr>
<tr>
<td><strong>Meteorological measurement</strong></td>
<td>June 13, 2010~now</td>
<td>August 17, 2011~now</td>
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<tr>
<td><strong>Net radiation measurement</strong></td>
<td>June 13, 2010~now</td>
<td>December 4, 2010~now</td>
</tr>
<tr>
<td><strong>Water temperature measurement</strong></td>
<td>June 13, 2010~now</td>
<td>August 17, 2011~now</td>
</tr>
</tbody>
</table>
3. Comparison analysis
Eddy Covariance-Sensible heat flux

- Meiliangwan
- Dapukou

Sensible heat flux, W m$^{-2}$

DOY of 2011
Eddy Covariance-Latent heat flux

Latent heat flux, W m$^{-2}$

DOY of 2011
Eddy Covariance-Net ecosystem exchange

Net Ecosystem CO₂ Exchange, mg m⁻² s⁻¹

DOY of 2011

Meiliangwan
Dapukou
Eddy Covariance-Daily total sensible heat flux

![Graph showing daily total sensible heat flux for Meiliangwan and Dapukou over the DOY of 2011.](image)
Eddy Covariance-Daily total latent heat flux
Eddy Covariance-Daily total net ecosystem exchange

![Graph showing daily total net ecosystem CO₂ exchange from DOY 230 to 270 in 2011, with blue line for Meilangwan and red line for Dapukou.](image)
Eddy Covariance-Daily mean CO$_2$ concentration

![Graph showing daily mean CO$_2$ concentration over DOY of 2011 for Meiliangwan and Dapukou.]
Meteorological-Air temperature

- Meiliangwan
- Dapukou

Air temperature, deg C

DOY of 2011

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Meteorological - Relative humidity

Meiliangwan - Dapukou

Relative humidity, %

DOY of 2011
Meteorological-Daily mean air temperature

![Graph showing daily mean air temperature for two locations, Meiliangwan and Dapukou, with data from DOY 230 to 270 of 2011. The graph displays fluctuations in temperature throughout the year.]
Meteorological-Daily mean relative humidity
Meteorological-Daily mean wind speed
Meteorological-Daily total precipitation
Radiation-Daily total reflected short-wave radiation
Radiation-Daily total incident short-wave radiation

![Graph showing daily total incident short-wave radiation over DOY of 2011 for Meiliangwan and Dapukou.]
Radiation-Daily mean albedo
Radiation-Daily total upward long-wave radiation

DOY of 2011

Daily total upward long-wave radiation, MJ·m⁻²·d⁻¹

Meiliangwan
Dapukou
Radiation-Daily total downward long-wave radiation
Water temperature—DPK

![Graph showing water temperature changes over DOY of 2011 for different depths: 20cm, 50cm, 100cm, 150cm, and Lake bottom.](image-url)
Water temperature-20cm depth

![Graph showing water temperature at 20cm depth for different days of the year, with two locations: Meiliangwan and Dapukou.](image)
Water temperature-50cm depth

Water temperature at 50cm depth, degC

DOY of 2011
Water temperature-100cm depth

[Graph showing water temperature over time with two lines representing Meiliangwan and Dapukou]
Water temperature-150cm depth
Water temperature-Lake bottom

![Graph showing water temperature changes over time for Meiliangwan and Dapukou.](image-url)
Water temperature-daily mean at 20cm depth
Water temperature-daily mean at 50cm depth
Water temperature-daily mean at 100cm depth

![Graph showing daily mean water temperature at 100cm depth for two locations: Meiliangwan and Dapukou. The graph plots the temperature in degrees Celsius against the DOY of 2011.]
Water temperature-daily mean at 150cm depth
Water temperature-daily mean at lake bottom

![Graph showing daily mean soil temperature at lake bottom, DOY of 2011. The graph compares Meiliangwan and Dapukou, with temperature values ranging from 20 to 32 degrees Celsius.](image-url)
Investigating the wind speed effect on albedo
Daily mean albedo - All days

All days

daily_albedo_DPK

daily_albedo_MLW
Clearness index

\[ k_t = \frac{S}{S_e} \]

- S: incident solar irradiance (W.m\(^{-2}\)) received by underlying surface;
- \( S_e \): the extraterrestrial irradiance (W.m\(^{-2}\));

(Gu et al, 1999)
Daily mean albedo-Clear skies (30 days)
Daily mean albedo - Overcast skies (20 days)
Clear skies-wind speed vs. albedo at MLW
Clear skies-wind speed vs. albedo at DPK
Daily mean wind speed vs. daily mean albedo
Dekad water quality measurement sites
YSI-Water temperature

DOY of 2010
YSI-specific conductivity

![Graph showing YSI-specific conductivity over DOY of 2010 with specific conductivity values ranging from 0.2 to 0.7 ms/cm and DOY values from 116 to 266. The graph includes three curves represented by symbols: 4, 5, and 10.](image)
YSI-pH

![YSI-pH Graph](image)

**Graph Title:** YSI-pH

**Graph Description:**
- The graph shows the pH levels from DOY 116 to 266 in 2010.
- Data points are represented by lines marked with markers: 4, 5, and 10.
- The pH scale ranges from 7.0 to 9.5, with increments of 0.5.
- The DOY of 2010 is plotted on the x-axis.
- The pH values are plotted on the y-axis.
YSI-Oxidation-reduction potential (OPR)

![Graph showing ORP over DOY of 2010]

- ORP, mV
- DOY of 2010

Lines marked with 4, 5, and 10
YSI-Turbidity

DOY of 2010

turbidity, NTU

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YSI-Oxidation-Chlorophyll concentration

Chlorophyll concentration, μg/L

DOY of 2010
YSI-Oxidation-Blue-green algae density (BGA)

DOY of 2010

BGA, cells/mL

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YSI-Oxidation-Dissolved oxygen (DO)

![Graph showing dissolved oxygen levels over DOY of 2010 with lines representing different DOYs (4, 5, and 10).]
## 4. Conclusion

<table>
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<tr>
<th>Parameters</th>
<th>Relationship</th>
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<tbody>
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<td>Sensible heat flux</td>
<td>MLW ≠ DPK</td>
</tr>
<tr>
<td>Latent heat flux</td>
<td>MLW ≠ DPK</td>
</tr>
<tr>
<td>NEE</td>
<td>MLW ≠ DPK</td>
</tr>
<tr>
<td>CO₂ concentration</td>
<td>MLW &lt; DPK</td>
</tr>
<tr>
<td>Air temperature</td>
<td>MLW ≈ DPK</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>MLW &lt; DPK</td>
</tr>
<tr>
<td>Wind speed</td>
<td>MLW &lt; DPK</td>
</tr>
<tr>
<td>Precipitation</td>
<td>MLW &gt; DPK</td>
</tr>
<tr>
<td>Reflected short-wave radiation</td>
<td>MLW &lt; DPK</td>
</tr>
<tr>
<td>Incident short-wave radiation</td>
<td>MLW ≈ DPK</td>
</tr>
<tr>
<td>Daily mean albedo</td>
<td>MLW &lt; DPK</td>
</tr>
<tr>
<td>Upward long-wave radiation</td>
<td>MLW ≈ DPK</td>
</tr>
<tr>
<td>Downward long-wave radiation</td>
<td>MLW ≈ DPK</td>
</tr>
<tr>
<td>Water temperature</td>
<td>MLW _variation &gt; DPK _variation</td>
</tr>
</tbody>
</table>
• With similar transmittance, high albedo corresponds to low wind at small to moderate solar elevation on hourly scale, but the phenomenon disappears when it comes to diurnal scale.

• The difference between daily mean albedo at MLW and DPK may comes from water quality difference.
5. Discussion

- albedo
  - Hourly scale
  - Diurnal scale
  - Monthly scale

- Solar elevation
- Wind speed
- Atmospheric conditions
- Water quality
- Solar motion

Atmospheric conditions

Water quality

Solar motion

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Look forward to your comments and suggestions