**Surface fluxes – analysis of Fluxnet data  
Answer sheet**

|  |  |
| --- | --- |
| Student (name) |  |

# Part I - Characterization of the climate at the sites

## 1. Yearly cycle

Analysis of background variables. Describe for three variables the typical yearly cycle and compare that between the three sites. Try to explain your findings.

|  |  |  |
| --- | --- | --- |
| Variable | **Typical yearly cycle  (+ explanation)** | **Comparison between sites  (+ explanation)** |
| temperature |  |  |
| RH |  |  |
| VPD |  |  |
| Wind speed |  |  |
| Precipitation |  |  |
| [CO2] |  |  |

## 2. Energy balance terms, typical daytime values

Typical values for daily mean surface energy balance terms (e.g. ‘summer’ means roughly the average value for all summers in the plot)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Site** | **Loobos** | | **Horstermeer** | | **Rollesbroich** | |
|  | **summer** | **winter** | **summer** | **winter** | **summer** | **winter** |
| net radiation (Wm-2) |  |  |  |  |  |  |
| sensible heat flux (Wm-2) |  |  |  |  |  |  |
| latent heat flux (Wm-2) |  |  |  |  |  |  |
| Interpretation (summer vs. winter; different sites; variability around mean) |  | | | | | |

## 3. Variation between years

For each site you see that the typical summer and winter values vary somewhat between years. Find out possible cause for this variability (so apart from observed difference in flux, what other variables are different between the years that could explain the difference in the flux)

|  |  |  |
| --- | --- | --- |
| **Site** | **Flux** | **Variation and explanation** |
| Loobos | LE |  |
| Horstermeer | Q\* |  |
| Loobos | Q\* |  |

# Part II - Evapotranspiraton

## 4. Partitioning between LvE and H

When considering the surface energy balance, one important aspect is the partitioning of available energy between sensible and latent heat flux. Describe the partitioning for each surface type and how it varies through the year.

|  |  |
| --- | --- |
| **Site** | **Findings on partitioning (+ explanation)** |
| **Loobos** |  |
| **Horstermeer** |  |
| **Rollesbroich** |  |

## 5. Crop factors and reference evapotranspiration

Estimates of actual evapotranspiration are often based on reference evapotranspiration values, with or without the application of crop factors. Compare for each site the actual evapotranspiration to the Makkink reference evapotranspiration (ET\_Makkink) and make an estimate of the crop factor that connects the two. Discuss your findings.

|  |  |
| --- | --- |
| **Site** | **Findings on reference ET vs. actual ET (+ explanation)** |
| **Loobos** |  |
| **Horstermeer** |  |
| **Rollesbroich** |  |

# Part III - Carbon-related fluxes

## 6. Typical yearly cycle of NEE and GPP

Carbon-related fluxes. Consider the typical yearly cycle, compare the sites. Finally, compare the values for GPP and NEE explicitly.

|  |  |  |
| --- | --- | --- |
| Variable | **Typical yearly cycle  (+ explanation)** | **Comparison between sites  (+ explanation)** |
| NEE |  |  |
| GPP |  |  |
| respiration |  |  |
| NEE vs GPP |  |  |

7. Light response curve for each site

|  |  |  |  |
| --- | --- | --- | --- |
| **Site** | **Initial light-use efficiency (umol/J)** | **Maximum assimilation rate (umol/m2/s)** | **Plot** |
| **Loobos** |  |  |  |
| **Horstermeer** |  |  |  |
| **Rollesbroich** |  |  |  |

Comparison between the sites

|  |
| --- |
|  |

8. Water use efficiency (WUE)

|  |  |  |  |
| --- | --- | --- | --- |
| **Site** | **Initial WUE (at low fluxes) (umol/J)** | **WUE at maximum fluxes (umol/J)** | **Plot** |
| **Loobos** |  |  |  |
| **Horstermeer** |  |  |  |
| **Rollesbroich** |  |  |  |

Comparison between the sites

|  |
| --- |
| I |