To; June 23, 2005

Dennis Baldocchi
University of California-Berkeley
Berkeley Atmospheric Science Center
Berkeley, CA

From;
Hank Loescher
Oregon State University
AmeriFlux QA/QC lab, Forest Science
Corvallis, OR

Dear Dr. Baldocchi,

Thank you for making possible a comparison between your Tonzi Ranch flux site and the AmeriFlux Portable eddy covariance system, March 3 – 13, 2005. This is a preliminary report that outlines what I have found to date. I have made some suggestions and I will be looking forward to your interpretation of the data and how some problems can be resolved. Overall, the comparison appears very good.

Graphs are labeled. Flux data was collected by Portable System 1 and were screened using QC flags according to the CarboEurope Spoleto Agreement (values 0 and 1 passed quality checks and used for analyses). Meteorological and ancillary data collected by the Portable System 1 were checked with plausibility limits. AmeriFlux data are presented as the independent variable in the regressions. 1:1 lines are apparent. Where appropriate I have presented how the AmeriFlux two (open- and closed-path) systems compare, and have also provided our cospectra and stationarity data. The graphics are embedded as *eps files. So if you have an application that can access the graphics, you can expand the timeseries data to take a closer look at the relationships. If not, I can forward them over to you in another format.

Thank you for being patient for these results. I have recently been training a new post-doc, automating all the analyses for this (and future) analysis, and of course, making other comparisons. If you wish us to look further into specific comparisons we would be happy to do so.

Cheers-Hank

Still needed:

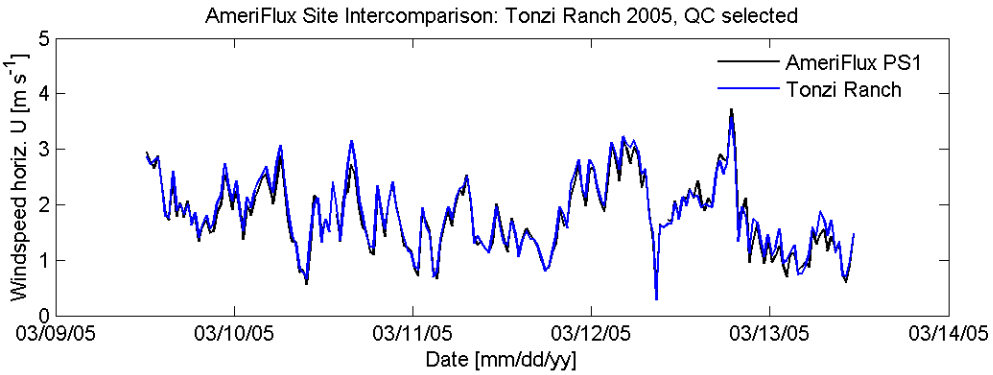
1. Sonic temperature, and
2. WPL for λE.

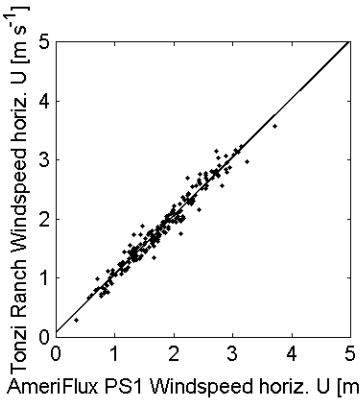
Comments:

1. At first, the time stamps from Tonzi Ranch data were confusing, so maybe they could be explained more explicitly in a metafile to prevent misinterpretation (in terms of starting time, end time), thanks.
2. Mean horizontal windspeed compared very well (slope = 0.99, R2 = 0.96), but mean wind direction had a significant offset of 45º E. Last year's data at Vaira, the wind direction had a significant ~ 17º E offset. I determined our sonic orientation using a compass taking into account magnetic declination. I am confident in our sonic orientation during this sampling period as I verified it twice during my visit. One possible explanation is the built-in wind direction offset of all Gill sonics between the North arrow displayed on the top of the sonic and the true North (causing an offset of 30º). The additional 15º may be due to not accounting for magnetic declination (at Tonzi we estimated it to be 14.7º). Could you verify the orientation of your sonic and ensure you are using the correct values for your calculations? Do you have any other independent means of determining wind direction?
3. Mean air temperature compared very well with a slope close to unity and a small offset (~0.4 ºC). I had placed part of our radiation shield (from our aspirated shield) over your radiation shield. So some of your mid-day air temperature may be ameliorated from the incident radiation load. Still, some of your mid-day air temperatures were higher than our estimates, suggesting aspiration may couple your sensor more closely to a *true* air temperature and improve our future comparisons. The relationship between our CSAT-3 sonic temperature and our aspirated air temperature was linear, but with an ~ 2 C offset. ***It would be good to compare the linearity between your sonic and air temperatures with Tonzi Ranch data.*** I assume S. Ma is still working on putting together some Gill data for us to look into this further. Keep me posted, please.
4. Mean atmospheric pressure estimates from Tonzi seem to have either a range error (wrong range code in the datalogger), an error in digitizing the signal, or it may not be properly warmed up before taking its reading. This is a fairly minor issue, but you may wish to look into this further.
5. Mean PPFD from Tonzi was in good agreement (R = 0.99), but only accounted for 80% of our measurements. Incident shortwave estimates compared very well. If we assume the incident shortwave is reliable, then at maximum incident shortwave (~ 750 W m^{-2}), then PPFD should be ~ 1500 μmol m^{-2} s^{-1} (this observation is also corroborated with our other shortwave sensors). Can you please check your PPFD sensor and its calibration coefficients? I believe we did not receive data from your longwave sensors, but it appears from the Rn comparison that one of your longwave sensors (downward welling) may need recalibration.
6. Scalar [CO2] concentrations from Tonzi's Li-7500 were significantly higher than that found by our open-path IRGA, by ~ 28 μmol m^{-2} s^{-1}. We did not have high confidence in our [CO2] estimates from our closed-path IRGA (Li-7000). As it turned out, Li-cor has recalled several Li-7000 with faulty detectors, which had caused the zero drift we had observed during your comparison. It is curious that last year we had a faulty open-path sensor that Li-cor had to fix, and this year it was the opposite. Our [CO2] estimates between our two IRGAs compared well

using limited closed-path data that we have confidence in, and it is unlikely that mid-day [CO2] concentrations were ~400 μmol m^{-2} s^{-1}. We did not receive your high precision [CO2] data, can you compare its data against your 7500 data? But comparing our closed-path [CO2] to your estimates is likely unimportant now that we cannot trust our closed-path [CO2] estimates. Your higher [CO2] estimates did not seem to affect either your carbon fluxes or WPL term. Your [H2O] estimates on the other hand, compare lower than our open-path estimates by ~ 14.5 mmol m^{-2} s^{-1}. It is unclear if the lower [H2O] estimates had affected your IRGA gain, but it stands to reason since youρ λE estimates are ~ 30% lower than ours.

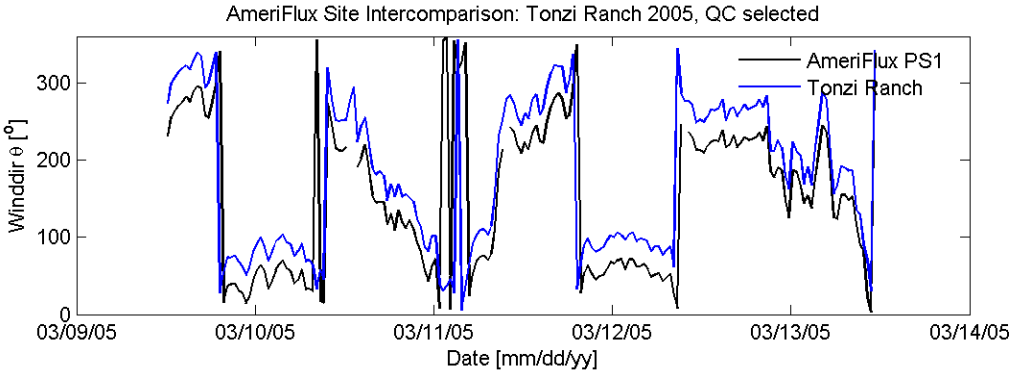
7. Sonic derived second-order statistics (fluxes) compared very well, slope of u* and H were both 0.98, with small or not significant offsets.

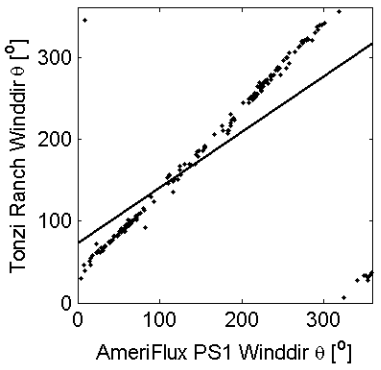




y = 0.99x+0.08, R^2 = 0.96, n = 187

Period: 09-Mar-2005 12:15:00 to 13-Mar-2005 11:15:00





y = 0.68x+72.7, R^2 = 0.474, n = 187

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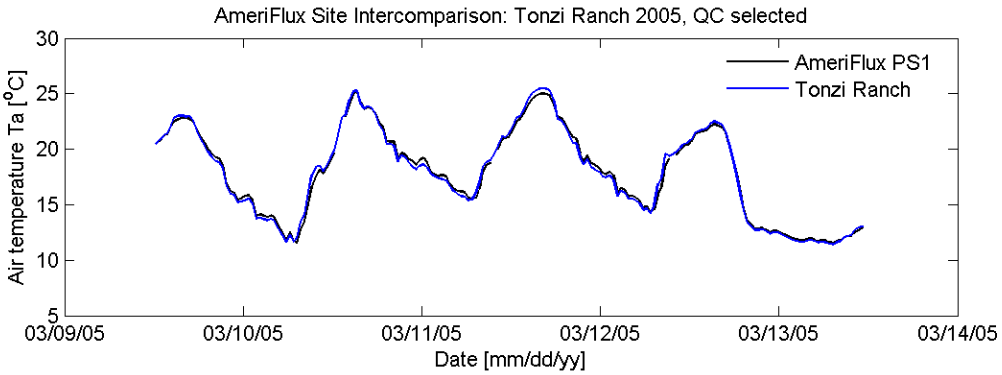

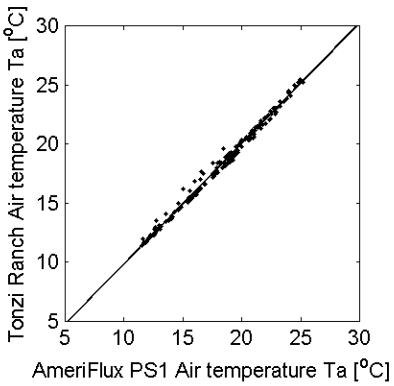

y = 1.02x-0.39, R^2 = 0.994, n = 187

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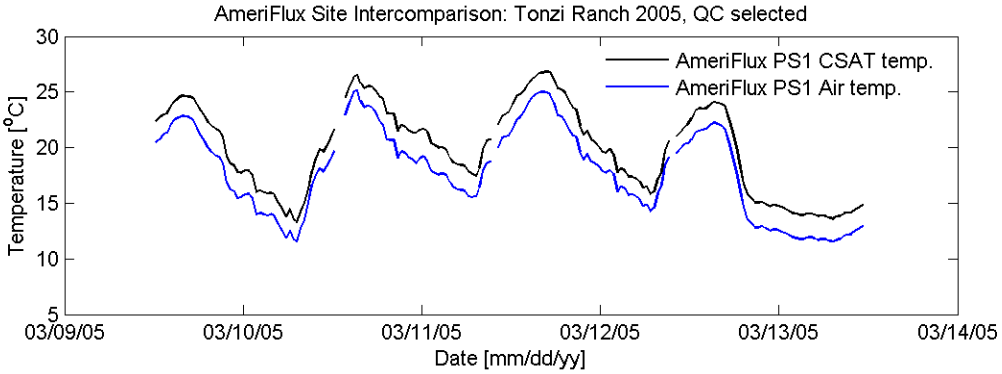

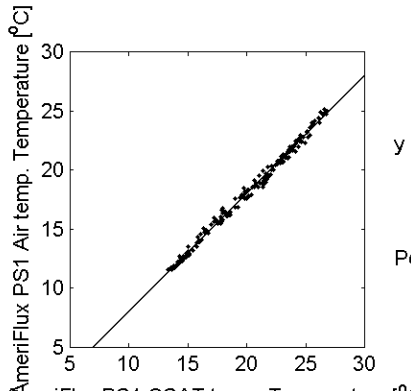

y = 1.00x-2.00, R^2 = 1.00, n = 187

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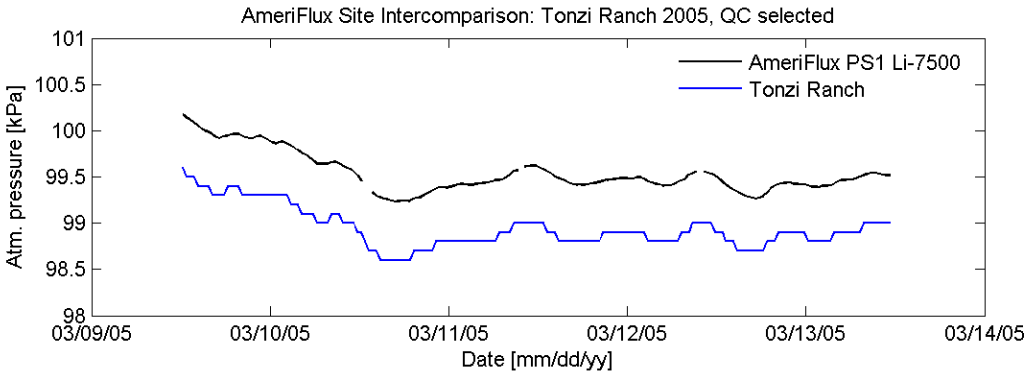

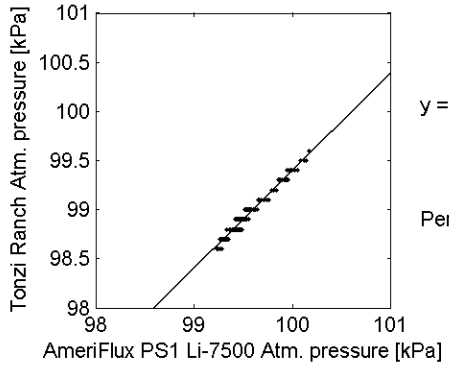

y = 0.99x+0.02, R^2 = 0.968, n = 187

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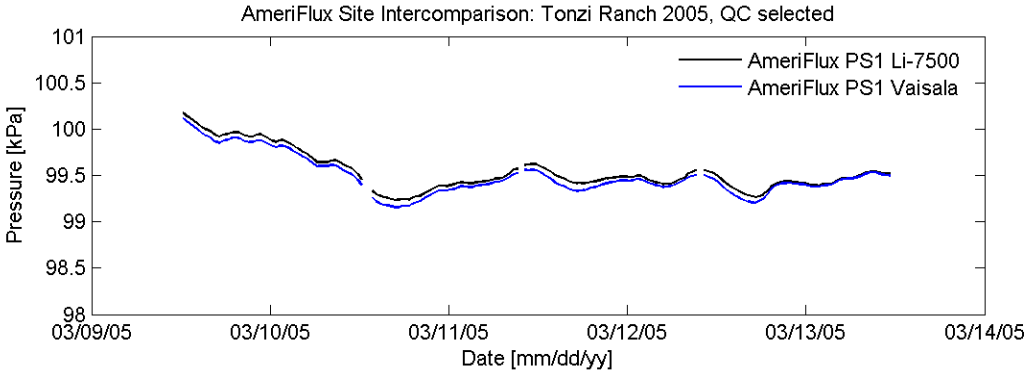

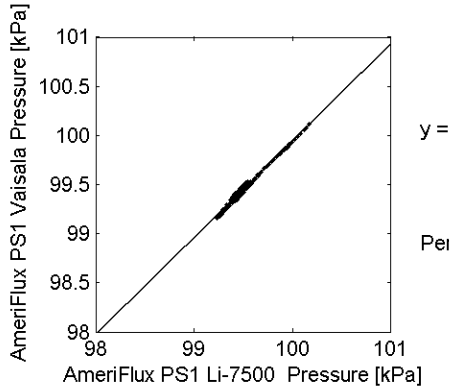

y = 0.98x+1.58, R^2 = 1.00, n = 187

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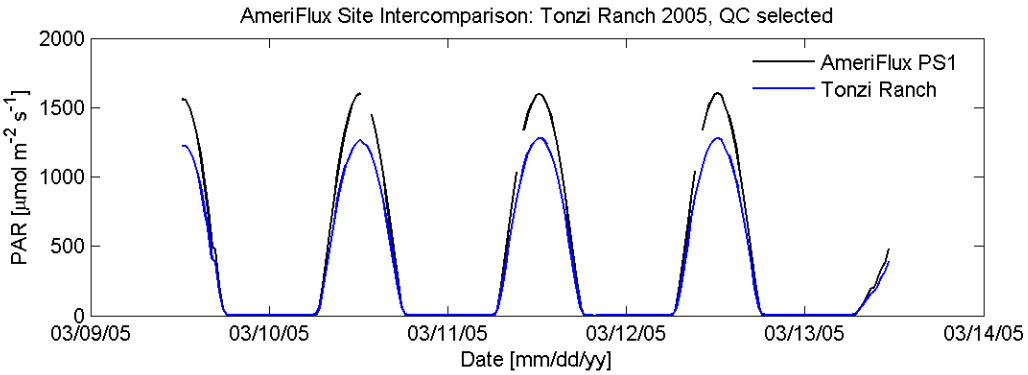

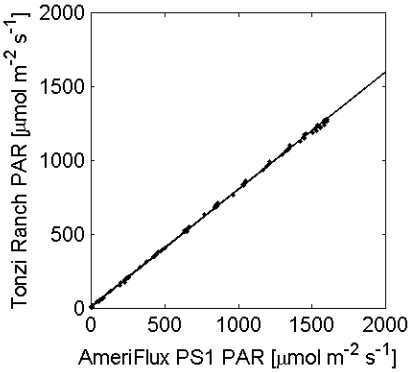

y = 0.8x+7.39, R^2 = 1, n = 187

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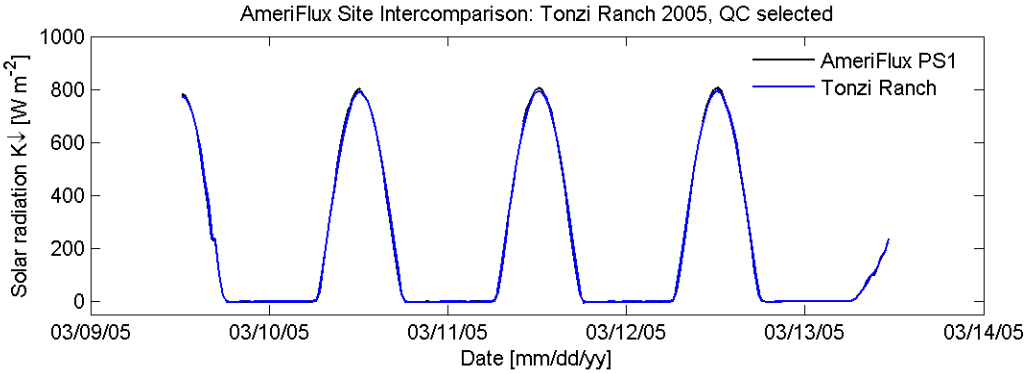
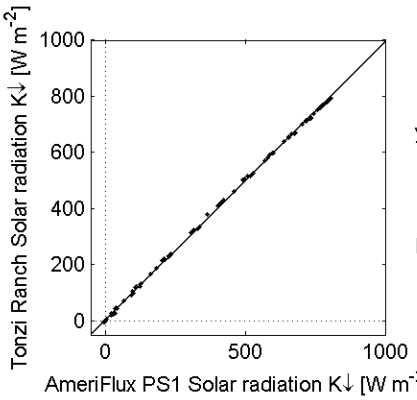
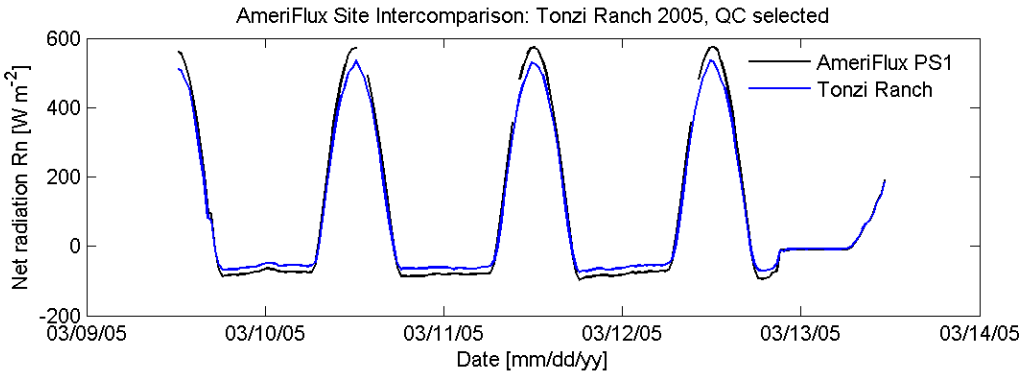
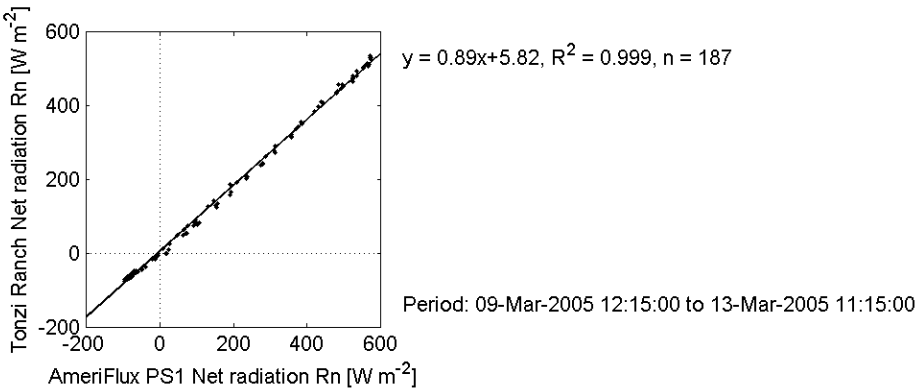


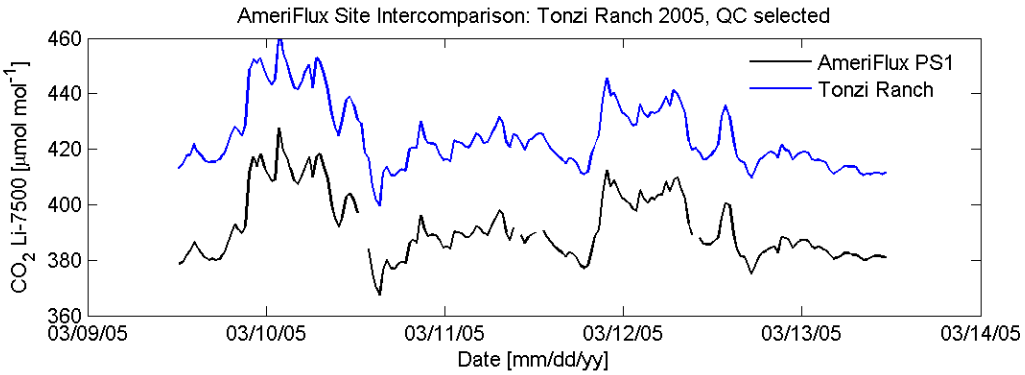


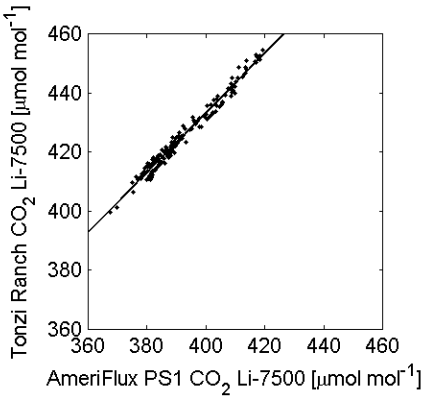
y = 0.99x+1.71, R^2 = 1.00, n = 187

Period: 09-Mar-2005 12:15:00 to 13-Mar-2005 11:15:00


AmeriFlux Site Intercomparison: Tonzi Ranch 2005, QC selected
Net radiation Rn [W m-2]
600
400
200
0
-200
03/09/05
03/10/05
03/11/05
03/12/05
03/13/05
03/14/05
Date [mm/dd/yy]
AmeriFlux PS1
Tonzi Ranch

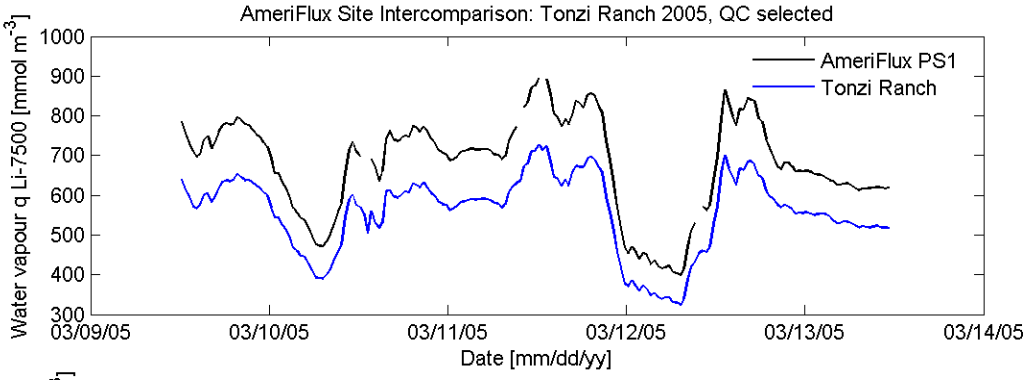

Tonzi Ranch Net radiation Rn [W m-2]
600
400
200
0
-200
-200
0
200
400
600
AmeriFlux PS1 Net radiation Rn [W m-2]
y = 0.89x+5.82, R2 = 0.999, n = 187
Period: 09-Mar-2005 12:15:00 to 13-Mar-2005 11:15:00

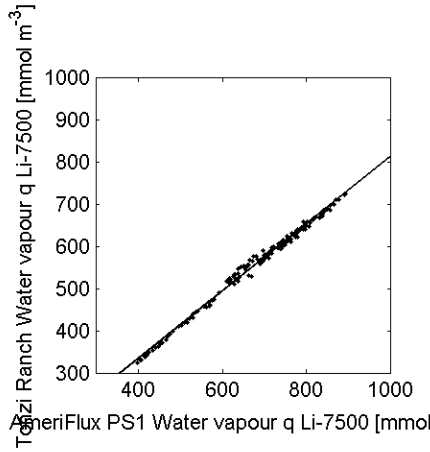




y = 1.01x+28.25, R^2 = 0.98, n = 186

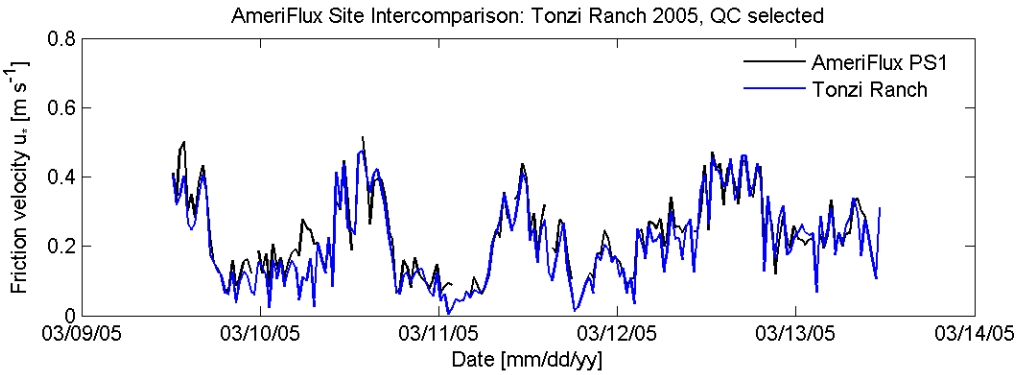
Period: 09-Mar-2005 12:15:00 to 13-Mar-2005 11:15:00

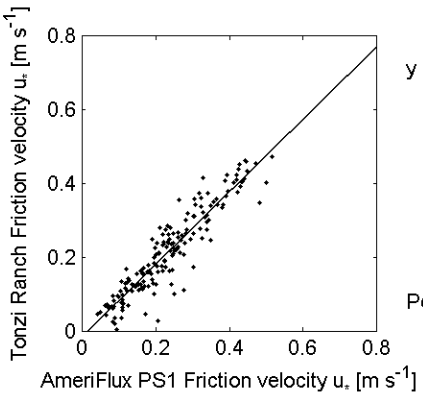




y = 0.8x+14.48, R^2 = 0.992, n = 186

Period: 09-Mar-2005 12:15:00 to 13-Mar-2005 11:15:00





y = 0.98x-0.02, R^2 = 0.869, n = 177

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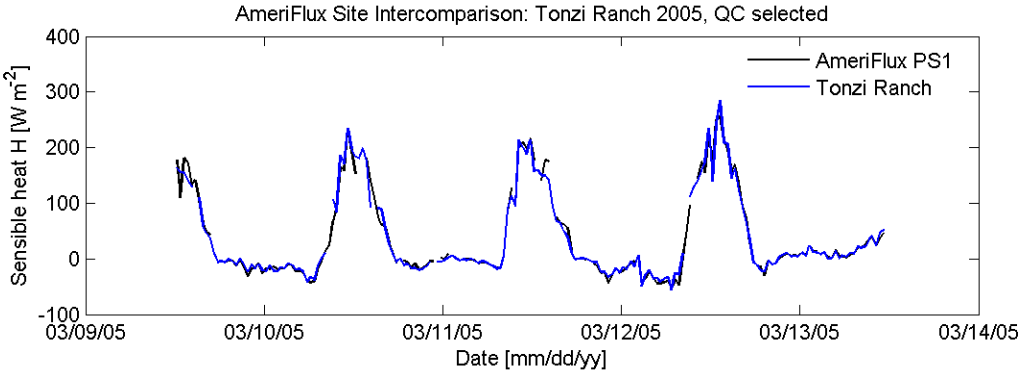

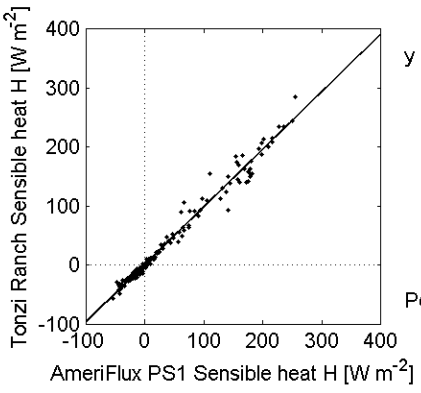

y = 0.98x+0.94, R^2 = 0.98, n = 167

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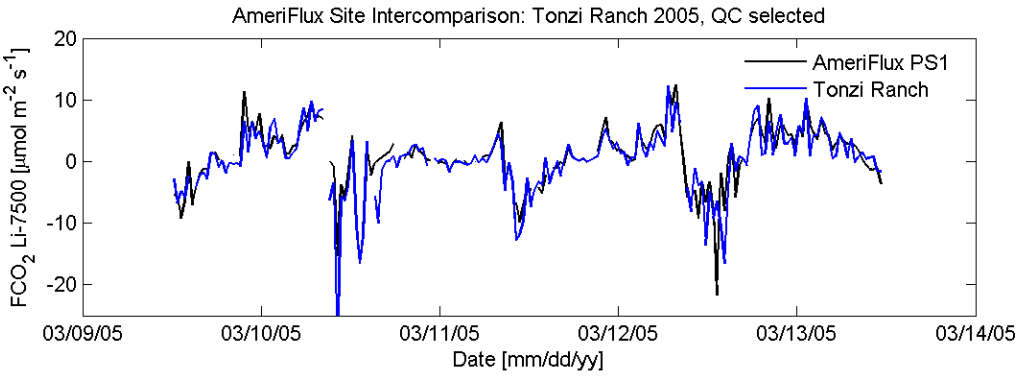
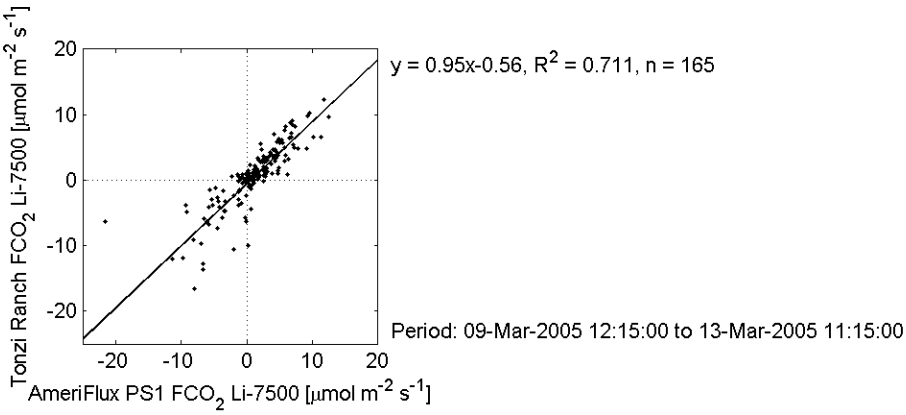
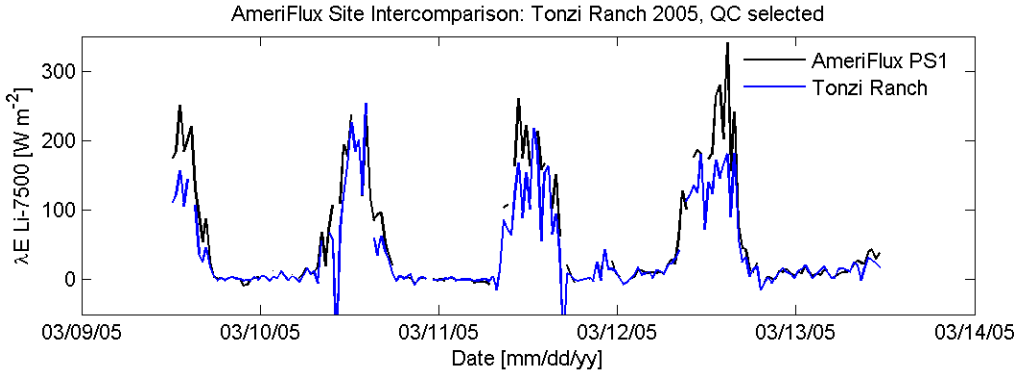
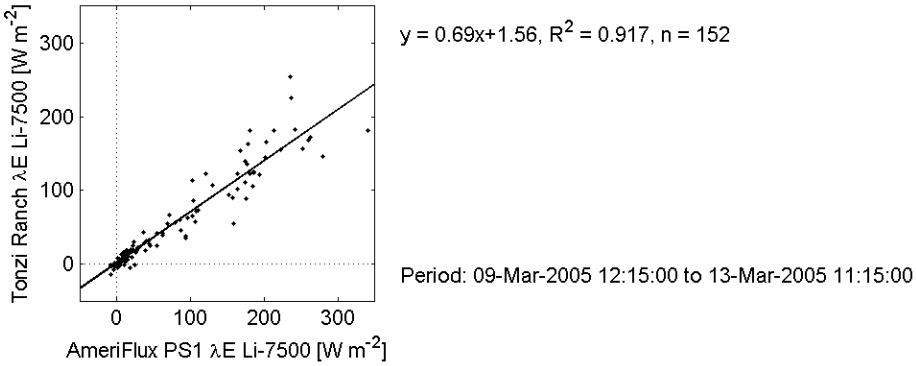

AmeriFlux Site Intercomparison: Tonzi Ranch 2005, QC selected
AmeriFlux PS1
Tonzi Ranch
FCO2 Li-7500 [µmol m-2 s-1]
20
10
0
-10
-20
03/09/05
03/10/05
03/11/05
03/12/05
03/13/05
03/14/05
Date [mm/dd/yy]


Tonzi Ranch FCO2 Li-7500 [µmol m-2 s-1]
AmeriFlux PS1 FCO2 Li-7500 [µmol m-2 s-1]
20
10
0
-10
-20
y = 0.95x-0.56, R2 = 0.711, n = 165
Period: 09-Mar-2005 12:15:00 to 13-Mar-2005 11:15:00


AmeriFlux Site Intercomparison: Tonzi Ranch 2005, QC selected
AmeriFlux PS1
Tonzi Ranch
λE Li-7500 [W m-2]
300
200
100
0
03/09/05
03/10/05
03/11/05
03/12/05
03/13/05
03/14/05
Date [mm/dd/yy]


Tonzi Ranch λE Li-7500 [W m-2]
AmeriFlux PS1 λE Li-7500 [W m-2]
300
200
100
0
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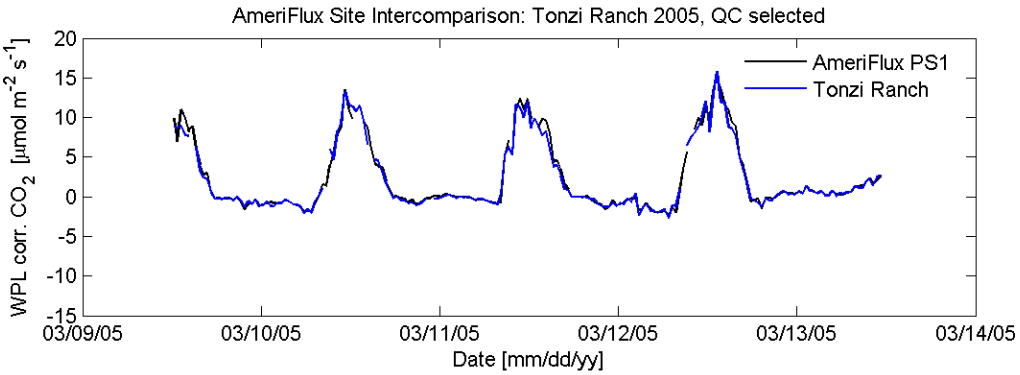
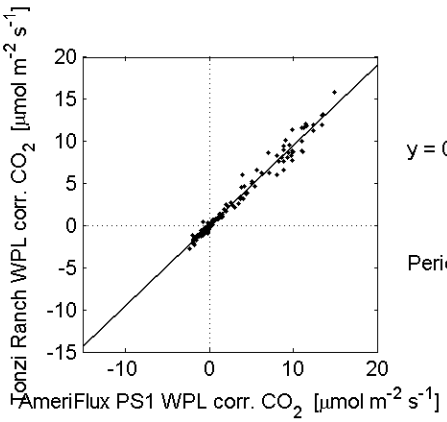
Period: 09-Mar-2005 12:15:00 to 13-Mar-2005 11:15:00





y = 0.96x-0.04, R^2 = 0.98, n = 181

Period: 09-Mar-2005 12:15:00 to 13-Mar-2005 11:15:00