From: Andreas Muenchow <muenchow@UDel.Edu>
Subject: **Low-pass Filter (Fortran)**
Date: June 21, 2012 1:59:58 PM EDT
To: Allison Einolf <aeinolf@macalester.edu>
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Allison and Julie:

Please find a set of subroutines that include a Lanczos raised cosine low pass filter that I posted at

http://muenchow.cms.udel.edu/ForAllison/filter.f

that you need to compile and link to your existing fortran codes. The call from your main program is made via

```
call filter(dt,n,val,riww,tco)
```

where

dt time step in hours
n number of data in array val
val array of raw data values (on input) to be filtered (on output)
riww number of filter weights (a filter design parameter)
tco time scale where half the variance is passed (a filter design parameter)

Tides are often removed well with riww=75 and tco=34 (hrs). Think of the filter as a sliding window placed over the time series data where within each window some "fancy averaging" is conducted. Mathematically, the code executes a convolution of the time series data with a set of filterweigts. This time-domain convolution corresponds to a frequency-domain multiplication where the Fourier transform of the filter-weight attempts to approach a step-function with a value of 1 above tco and 0 below tco.

Have fun applying it to your data and play with it. If there are any problems implementing it ... ask me for help.

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