
Subject: Re: Interpolation routines

Posted by [laura.hike](#) on Tue, 02 Feb 2016 22:38:15 GMT

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On Tuesday, February 2, 2016 at 2:01:35 PM UTC-8, Paul van Delst wrote:

Yes, this is the only solution that I've found. It seems ridiculous to have to do this manually -- surely the interpolation function should handle this, or at least have it as an option. Cutting the range does have the drawback of not assigning a value to a point that is barely outside the input range. Could throw in a little margin for that, I suppose.

SWin is related to density, which is linear in P.

>
> Umm, don't you specify the output interpolated pressures? So shouldn't
> you just truncate them based on the inputs? That is, the maximum
> output/interpolated pressure is the first value that is less than the
> maximum finite input pressure. (Does that sound right?)

>
> I interpolate lots of atmospheric temperature and absorber (e.g. H2O,
> O3, etc) profiles and that's what I do. I agree with you that
> extrapolation is completely invalid (in general), and in my case for
> T(p) and H2O(p)/etc profiles it gets non-physical real fast.

>
> Also, I don't know what the "SW" data is but, for atmospheric profiles,
> shouldn't you be interpolating in ln(P) space rather than P?

>
>
>> I show an
>> example below in order to be clear. Yes, this is a vertical profile
>> in pressure coordinates, for anyone who cares:

>>
>> Input abscissa Pin:

>>
>> 0.187500 0.362500 0.675000 1.26250 2.02500
>> 2.98750 4.47500 6.75000 8.40000 8.98750 9.62500
>> 10.2875 11.0000 11.7750 12.6000 13.4875
>> 14.4500 15.4750 16.5750 17.7625 19.0250
>> 20.3875 21.8625 23.4375 25.1250 26.9375
>> 28.8875 30.9750 33.2125 35.6125 38.1875
>> 40.9750 43.9750 46.3375 48.0000 49.7250
>> 51.5125 53.3625 55.2875 57.2875 59.3500
>> 61.4875 63.7000 66.0000 68.3875 70.8625
>> 73.4250 76.0750 78.8250 81.6875 84.6500
>> 87.7125 90.9000 94.2000 97.6125 101.150
>> 104.825 108.637 112.587 116.688 120.938

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>> 125.337    129.900    134.638    139.538    144.625
>> 149.913    155.388    161.062    166.938    173.025
>> 179.350    185.913    192.700    199.737    207.038
>> 214.663    222.625    230.888    239.513    248.513    257.913
>> 267.725    277.925    288.575    299.688    311.237
>> 323.100    335.288    347.938    361.050    374.463
>> 388.188    402.400    417.025    432.087    447.612
>> 463.550    479.925    496.812    514.300    532.287
>> 550.725    569.738    589.312    609.463    630.287
>> 651.825    NaN        NaN        NaN        NaN        NaN
>> NaN        NaN        NaN        NaN        NaN        NaN
>> NaN        NaN        NaN        NaN        NaN        NaN
>> NaN        NaN        NaN        NaN        NaN        NaN
>> NaN        NaN        NaN        NaN        NaN        NaN
>> NaN
>>
>> Output abscissa Pout:
>>
>> 0.100000    0.300000    0.400000    0.500000    0.700000
>> 1.00000    2.00000    3.00000    4.00000    5.00000    7.00000
>> 10.0000    20.0000    30.0000    40.0000    50.0000
>> 70.0000    100.000    150.000    200.000    250.000
>> 300.000    350.000    400.000    450.000    500.000
>> 550.000    600.000    650.000    700.000    725.000    750.000
>> 775.000    800.000    825.000    850.000    875.000
>> 900.000    925.000    950.000    975.000    1000.00
>>
>> Values obviously occur in Pout that are beyond the range of Pin.
>>
>> Ordinate in SWin:
>>
>> 0.000156151 0.000173488 0.000207377 0.000210915 0.000169155
>> 0.000110047 7.45450e-05 5.23441e-05 3.99181e-05 3.90353e-05
>> 3.75340e-05 3.97617e-05 3.25255e-05 3.04963e-05 3.44416e-05
>> 2.90153e-05 2.68362e-05 3.02042e-05 2.54594e-05 2.58893e-05
>> 2.62765e-05 2.39674e-05 2.39971e-05 2.40214e-05 2.37010e-05
>> 2.34202e-05 2.16869e-05 2.26950e-05 1.99376e-05 2.16858e-05
>> 1.91526e-05 1.85088e-05 1.88882e-05 1.80156e-05 1.72226e-05
>> 1.67287e-05 1.73794e-05 1.56135e-05 1.48229e-05 1.44584e-05
>> 1.51021e-05 1.45813e-05 1.19285e-05 1.34967e-05 1.10665e-05
>> 1.15942e-05 1.21990e-05 1.08427e-05 9.58437e-06 1.00086e-05
>> 8.94639e-06 9.36905e-06 8.25729e-06 8.73890e-06 7.72265e-06
>> 7.45533e-06 6.50589e-06 6.92547e-06 6.66663e-06 6.42854e-06
>> 6.20490e-06 5.99692e-06 5.77185e-06 5.05578e-06 4.90454e-06
>> 4.69174e-06 4.99278e-06 4.37616e-06 3.80173e-06 3.67547e-06
>> 3.93453e-06 3.40434e-06 3.28958e-06 3.18232e-06 3.06034e-06
>> 2.62840e-06 2.80613e-06 2.71086e-06 2.02691e-06 2.48816e-06
>> 1.59571e-06 2.53445e-06 2.43971e-06 3.04975e-06 4.47653e-06

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>> 4.95492e-06 6.00842e-06 7.14583e-06 7.06873e-06 7.76889e-06
>> 7.85854e-06 8.32823e-06 8.90338e-06 9.45487e-06 9.72611e-06
>> 9.55187e-06 9.46401e-06 8.91291e-06 9.40596e-06 8.94922e-06
>> 9.59435e-06 9.93338e-06 9.91535e-06 1.02259e-05 1.02142e-05
>> 1.00091e-05 8.75643e-06 8.13227e-06      NaN      NaN NaN
>> NaN      NaN      NaN      NaN      NaN      NaN
>> NaN      NaN      NaN NaN      NaN      NaN
>> NaN      NaN      NaN      NaN      NaN      NaN
>> NaN NaN      NaN      NaN      NaN      NaN
>> NaN      NaN      NaN
>>
>> Ordinate out:
>>
>> 0.000147821 0.000166955 0.000177699 0.000189441 0.000209155
>> 0.000217363 0.000170853 0.000109465 8.07843e-05 6.65560e-05
>> 4.99181e-05 3.92060e-05 2.45898e-05 2.22732e-05 1.85323e-05
>> 1.68197e-05 1.12288e-05 7.54906e-06 4.98966e-06 3.04681e-06
>> 1.66306e-06 4.97638e-06 7.80974e-06 9.37925e-06 9.38277e-06
>> 9.00669e-06 9.91276e-06 1.01958e-05 8.16361e-06 4.44220e-06
>> -3.16524e-06 -1.78092e-05 -4.18935e-05 -7.78224e-05 -0.000128000
>> -0.000194829 -0.000280715 -0.000388062 -0.000519273 -0.000676752
>> -0.000862904 -0.00108013
>>
>> Values are returned for every Pout, whether it's off the end of Pin
>> or not. If you plot these, they form an arc in the negative going to
>> magnitudes higher than any of the input values. Is there any way to
>> get rid of these short of searching for the max and min values of Pin
>> and excluding Pouts outside this range? How does interpol come up
>> with values out there anyway, given that inputs on either side of the
>> output should be required for the spline function? Adding all these
>> searches and exclusions would make using this function impractical,
>> given that I have to apply it thousands of times. Note that Pin
>> varies over time while Pout is fixed.
>>
>>

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