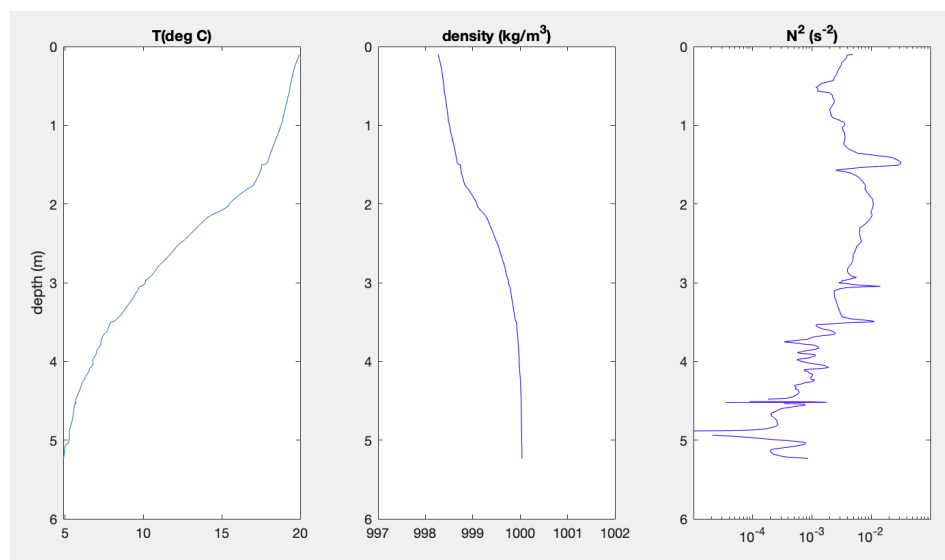


**Subject:** Re: calculate Brunt-Vaisala in R?  
**Date:** Friday, September 2, 2022 at 10:05:21 AM Central Daylight Time  
**From:** Sergei Katsev  
**To:** Swanner, Elizabeth S [GE AT]  
**Attachments:** image.png

Here is what I get - attached. If I got the conductivity units right, it looks like salinity does not matter much. I think the sensitive part is the initial cleanup of the data. I noticed there were two (identical?) profiles in the spreadsheet, so I truncated the series to use just one downcast. And then there were a lot of ups and downs from the CTD movement, which generated artifact wiggles in the profiles, so I removed the points with duplicate depths, and then smoothed the profile a bit with a running-average filter. I would guess after cleaning up the data your method would work as well. The need for smoothing depends on your calculation method: the stability frequency is a derivative (of the density profile), so noise between datapoints may strongly affect the local slope; some methods may automatically account for this, and some may not.

Sergei



On Fri, Sep 2, 2022 at 8:33 AM Swanner, Elizabeth S [GE AT] <[eswanner@iastate.edu](mailto:eswanner@iastate.edu)> wrote:

Hi Sergei,

OK, thanks, but I have a lot of datasets I want to analyze, so I'm hoping to figure out a workflow that works with me and my capabilities. I can get matlab, if you're willing to share your code, but I'm hoping to find something R-based since that is what I'm most familiar with at the moment.

I'm attaching my source files, code, and the N2 output.

Thanks,

Betsy

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**From:** Sergei Katsev <[skatsev@d.umn.edu](mailto:skatsev@d.umn.edu)>  
**Date:** Friday, September 2, 2022 at 8:16 AM  
**To:** "Swanner, Elizabeth S [GE AT]" <[eswanner@iastate.edu](mailto:eswanner@iastate.edu)>  
**Subject:** Re: calculate Brunt-Vaisala in R?

Hi Betsy,

I will try to calculate this with my matlab routine today. Do you have your calculation results as a spreadsheet?

Sergei

On Thu, Sep 1, 2022 at 3:47 PM Swanner, Elizabeth S [GE AT] <[eswanner@iastate.edu](mailto:eswanner@iastate.edu)> wrote:

Hi Sergei,

I have been trying to calculate the  $N^2$  for lakes we've been working on in Itasca State Park, which are really dilute. I want to assess how stably stratified they are. We have thermistor data from sensors in two lakes for 1 year each. I used the RLakeAnalyzer package to calculate  $N^2$  based only on temperature. Not surprisingly, they are only stable from temperature alone in summer.

I'm now trying to calculate the  $N^2$  from profiles made with my YSI ProDSS using temperature and salinity data. The RLakeAnalyzer package won't consider salinity for some reason, but I found the gsw (Gibbs Sea Water) package that can do it using salinity, temp and pressure. I've been working with the data attached, as the YSI reports salinity (psu), temp (f), and pressure (psi).

The package had these specifications

SA	Absolute Salinity [ g/kg ]
CT	Conservative Temperature [ degC ]
p	sea pressure [dbar], i.e. absolute pressure [dbar] minus 10.1325 dbar
latitude	latitude in decimal degrees, positive to the north of the equator. (This is called <code>lat</code> in the TEOS-10 Matlab code.)

I imported the dataset and converted those units with the following equations:

```
X20200527_Deming <- X20200527_Deming %>%
```

```
  mutate(Temperature = (Temperature-32)*(5/9),
```

```
    Salinity = (Salinity*1000),
```

```
    Pressure = (Pressure/1.45-10.1325))
```

(Do you see anything wrong with my conversions?)

Then I ran the N2 calculations and got a lot of strange numbers (plot attached). If I understand it right, a stable lake should be  $N_2 > 0$ , but I get lots of 0 and negative, and even some  $> 1$ , which makes me concerned either my conversions are incorrect, or the package does not work for freshwaters.

Do you have any thoughts about this? Or a better way to calculate (preferably in R)?

Thanks,

Betsy