The Cryosphere Discussions

The Cryosphere Discuss., author comment AC2
https://doi.org/10.5194/tc-2021-273-AC2, 2022

Reply on CC1

Frédéric Dupont et al.

Author comment on "A probabilistic seabed–ice keel interaction model" by Frédéric Dupont et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-273-AC2, 2022

Thanks for pointing out this dimensional inconsistency in the way the model is mathematically formulated. The equations are numerically correct if the random variable x' we use for thickness, that is represented by the log-normal distribution, is defined as x/1m, where x is the dimensional thickness in meters. The choice of the unit thickness is arbitrary though, in general. In the paper, I suggest we explicitly define this scaling as x' = x/□□, where □□ is a unit thickness that is used in the ice model. This way, taking the log of x' is correct. When retrieving the dimensional thickness quantity, we need to multiply back by □□ after taking the exponential. Then the expression for xkmax would need to be multiplied by □□ for it to bear units.

In the code, we can introduce a constant called

```
onemeter = 1_dbl_kind
```

which is used here

```
m_i  = sum(vcat)/onemeter
```

here

```
v_i = c0
  do n=1, ncat
```

```
  v_i = v_i + ncat(n)**2 / (max(acat(n), puny) * onemeter**2)
enddo
```

and here

```
x_kmax = onemeter*exp(mu_i + sqrt(2.0*sigma_i)*1.9430).
```

This new constant could be set to

```
onemeter = 100_dbl_kind
```

if the ice model has its thickness in cm, without the need to alter the numerical values used for tuning.