

somebody make a fancy title page

## Introduction

somebody write an introduction

somebody fix the references

- here is where we got the matlab file from: [http://www.seaice.dk/exercises/task3/Matlab/FW\\_funktion2\\_is.m](http://www.seaice.dk/exercises/task3/Matlab/FW_funktion2_is.m) (forward model by Dorthe Hofman-Bang)
- description of reference data: [http://www.seaice.dk/undervisning/Sotiris/SICCI\\_RRDB\\_Manual\\_v2.01\\_20170717.docx](http://www.seaice.dk/undervisning/Sotiris/SICCI_RRDB_Manual_v2.01_20170717.docx)

## 1 Validation of Forward Model

The forward model computes from a set of ocean and atmosphere parameters the brightness temperatures expected to be measured by a satellite radiometer. The input parameters are listed in Table 1, and the output parameters include values for both horizontal and vertical polarization at 6.93 GHz, 10.65 GHz, 18.70 GHz, 23.80 GHz, and 36.50 GHz.

	Forward Model		Reference Data	
	Abbrev.	Unit	Abbrev.	Unit
Ice concentration	C_is	fraction	ci	fraction
MY-fraction	F_MY	fraction		
Ice temperature	T_is	K	istl	K
Water vapour	V	mm (columnar)	tcwv	kg/m <sup>2</sup>
Cloud liquid water	L	mm (columnar)	tclw	kg/m <sup>2</sup>
Wind speed	W	m/s	ws	m/s
Sea surface temperature	T_ow	°C	sst	K

Table 1: Atmosphere and ocean parameters entered into the forward model

This forward model was validated by comparing its results to a set of reference data from ESA’s “Sea Ice Climate Change Initiative”. The reference data consists of brightness temperatures at the relevant polarizations and frequencies as measured by the AMSR-E and AMSR2 radiometers for a range of geocoded locations at a given time. The measured data sets are paired with numerical wheather predictions for the atmospheric and oceanic parameters at the same geocoded locations at near simultaneous time.

The forward model was developed for the AMSR-E instrument and even though the AMSR-E and AMSR2 instruments are similar, the two instruments are calibrated differently (ref: forbidden paper, find other reference?). We assume that the effect of the calibration difference is negligible, when we use the numerical wheather predictions as input in the forward model in order to compare the output with the AMSR2 measured brightness temperatures.

In order to use the reference data in the forward model it was necessary to perform unit conversions for the parameters water vapour and cloud liquid water, which were given in the columnar units of 1 kg/m<sup>2</sup> in the reference data, and have now been converted to 1 mm, indicating the height of water vapor or cloud liquid water if condensed uniformly across the column [3].

- 1 mm equals 1 kg/m<sup>2</sup>
- calibration differences mentioned in Leif's email
- wind direction (several components given in the reference data)
- ice temperature layers (several given in the reference data)
- MY ice fractions not being given in the reference data

Tests on individual geocoded points have shown (ok) agreement of the model with the reference data. Somebody program a 2D-image in matlab, or enter at least a table with values to compare.

## References

- [1] Dorte Hofman-Bang, Forward algorithm, September 2003.  
[http://www.seaice.dk/exercises/task3/Matlab/FW\\_funktion2\\_is.m](http://www.seaice.dk/exercises/task3/Matlab/FW_funktion2_is.m)  
[accessed: 18/11/2017]
- [2] Round Robin Data Package Manual, Version 2.0/, July 2017. Ref: SICCI SIC RRDP-07-17.  
[http://www.seaice.dk/undervisning/Sotiris/SICCI\\_RRDB\\_Manual\\_v2.01\\_20170717.docx](http://www.seaice.dk/undervisning/Sotiris/SICCI_RRDB_Manual_v2.01_20170717.docx) [accessed: 18/11/2017]
- [3] (unit conversion) <http://www.remss.com/measurements/atmospheric-water-vapor/> [accessed: 18/11/2017]