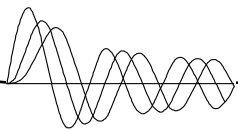
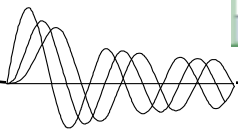
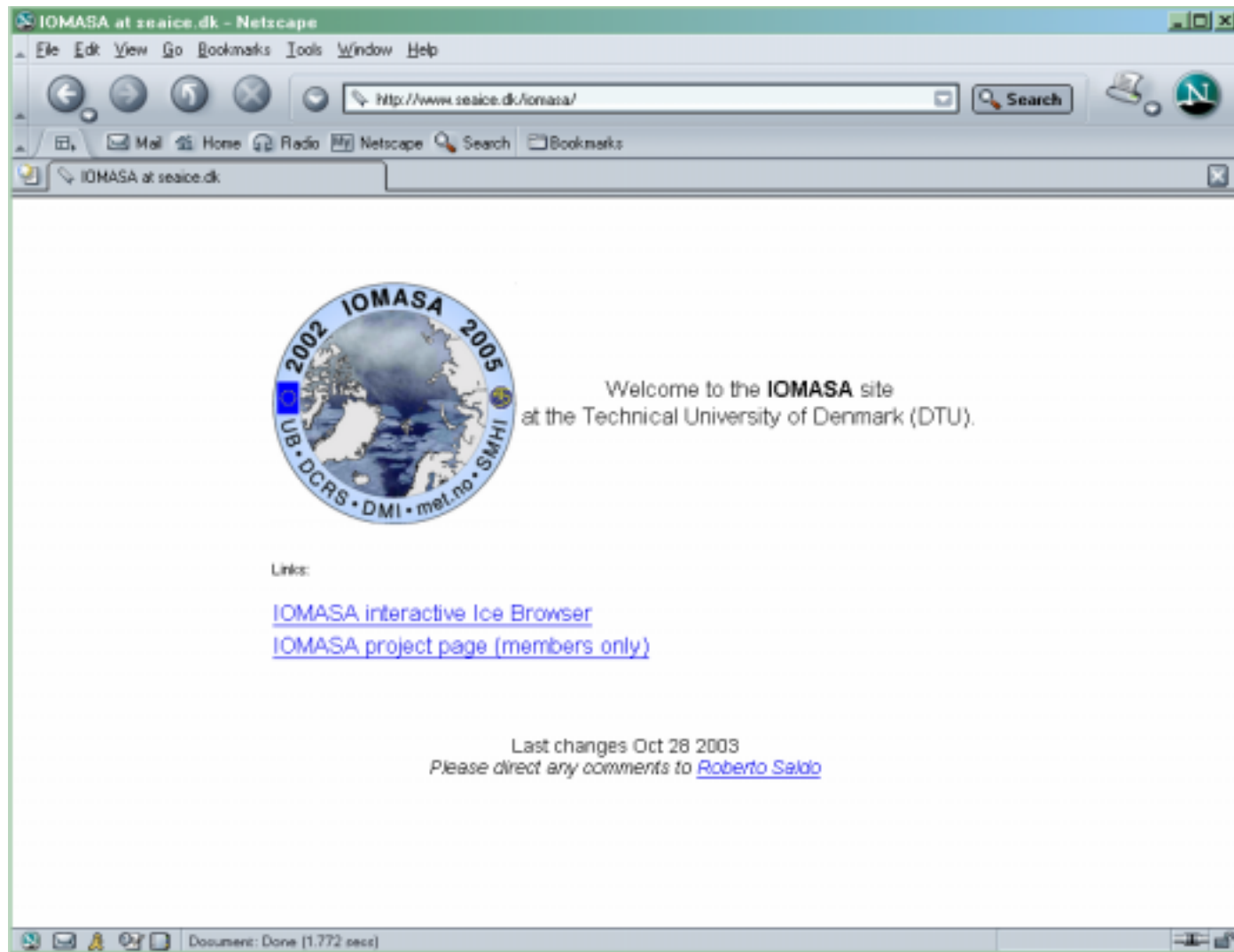


IOMASA DTU Status May 2004



DTU IOMASA Web site

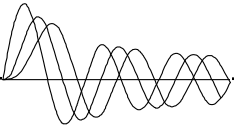
<http://www.seaice.dk/iomasa>



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IOMASA data processing at DTU

- **Advanced statistical retrieval**
 - SST, WS, WV, CLW, C, F, T_{ice}
 - Colour representation
 - Near real time processing
- **Time series analysis**
 - AMSR-E
 - AMSU



Estimation theory - 1

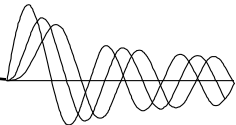
$$T_A(f, \theta, p) = F(\text{SST}, \text{WS}, \text{WV}(z), \text{CLW}(z), T_{\text{air}}(z), T_{\text{ice}}, C, e_t(f) \dots) \quad (7.1)$$

$$\mathbf{T}_A = \mathbf{F}(\mathbf{p}) \quad (7.2)$$

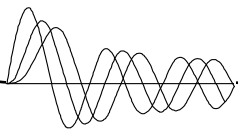
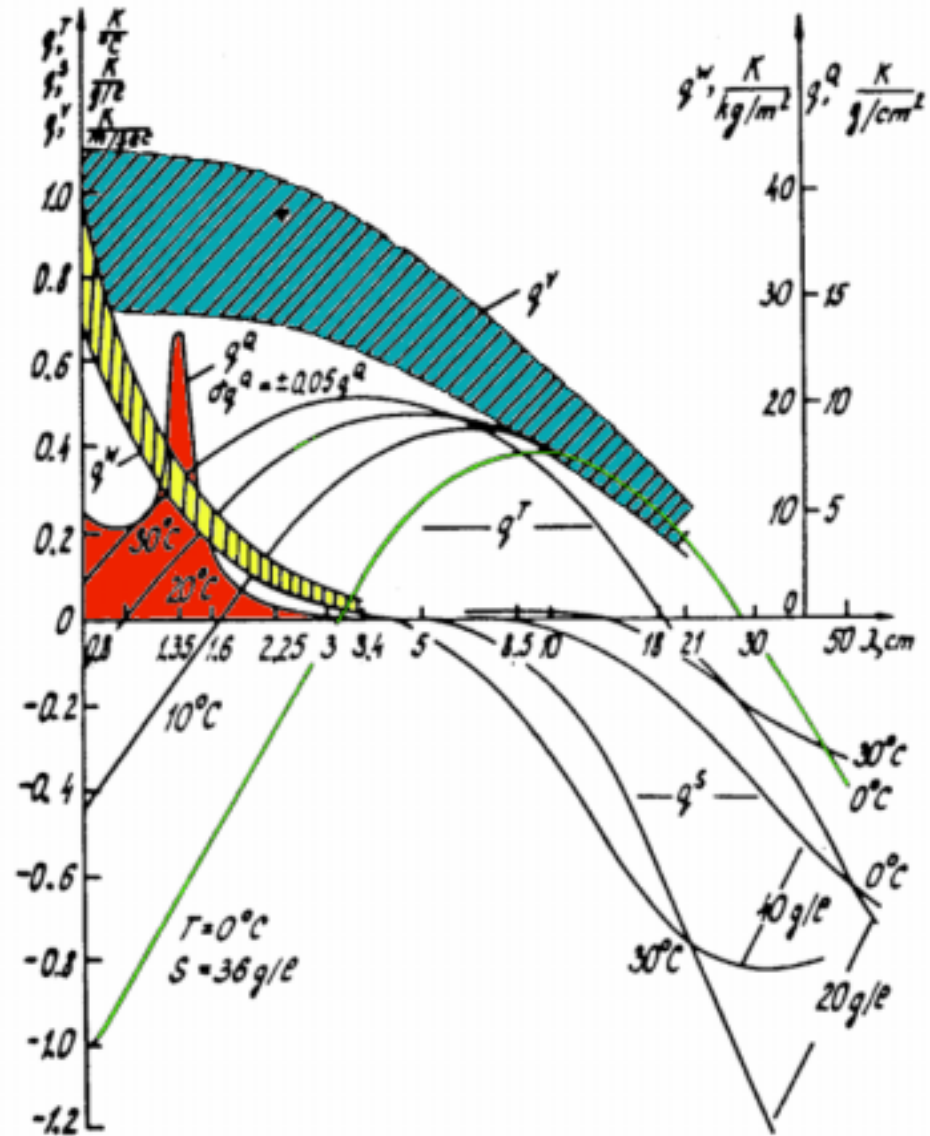
$$\mathbf{p} = (\text{SST}, \text{WS}, \text{WV}, \text{CLW}, T, C, F) \quad (7.3)$$

$$\mathbf{T}_A = \mathbf{M}\mathbf{p} \quad (7.4)$$

$$M_{ij} = \frac{\delta T_{\text{api}}}{\delta p_j} \quad (7.5)$$



Partial derivatives Atmosphere Ocean surface



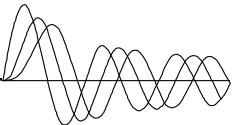
Estimation theory - 2

$$\hat{\mathbf{p}} = (\mathbf{M}^t \mathbf{M})^{-1} \mathbf{M}^t \mathbf{T}_{ap} \quad (7.6)$$

$$\mathbf{T}_A = \mathbf{M}\mathbf{p} + \mathbf{e} \quad (7.7)$$

$$\hat{\mathbf{p}} = (\mathbf{M}^t \mathbf{S}_e^{-1} \mathbf{M})^{-1} \mathbf{M}^t \mathbf{S}_e^{-1} \mathbf{T}_A \quad (7.8)$$

$$\hat{\mathbf{S}} = (\mathbf{M}^t \mathbf{S}_e^{-1} \mathbf{M})^{-1} \quad (7.9)$$



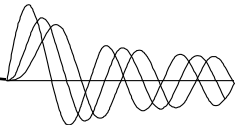
Estimation theory - 3

$$\hat{\mathbf{S}} = (\mathbf{S}_p^{-1} + \mathbf{S}_D^{-1})^{-1} \quad (7.10)$$

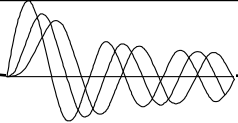
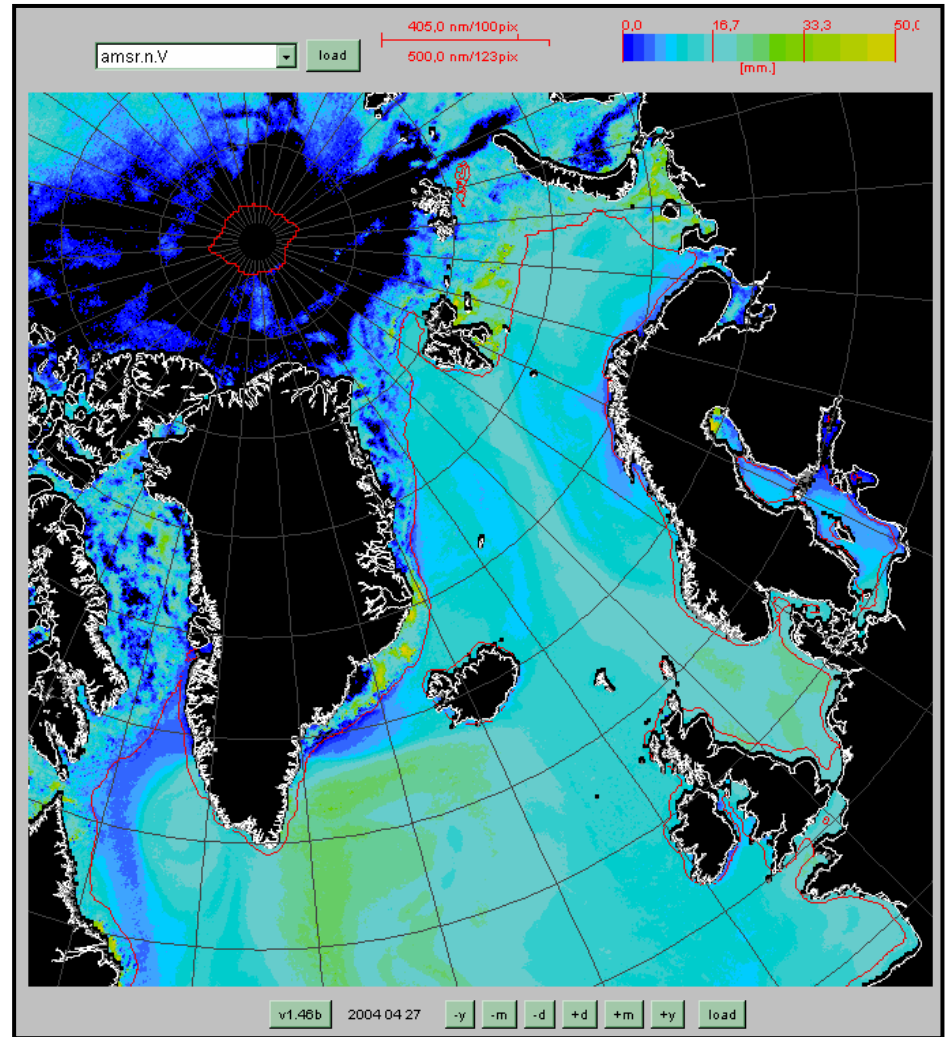
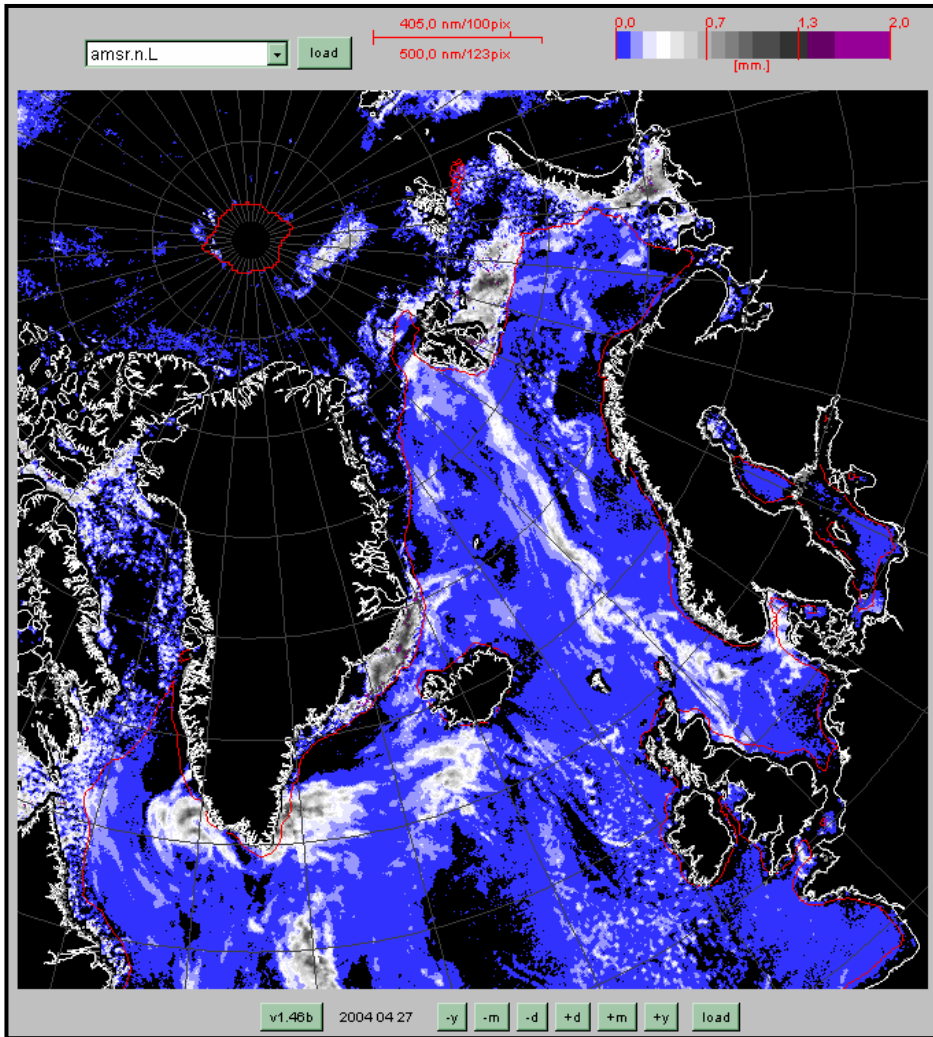
$$\hat{\mathbf{S}} = (\mathbf{S}_p^{-1} + \mathbf{M}^t \mathbf{S}_e^{-1} \mathbf{M})^{-1} \quad (7.11)$$

$$\hat{\mathbf{p}} = (\mathbf{S}_p^{-1} + \mathbf{S}_D^{-1})^{-1} (\mathbf{S}_p^{-1} \mathbf{p}_0 + \mathbf{S}_D^{-1} \mathbf{p}_1) \quad (7.12)$$

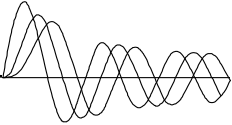
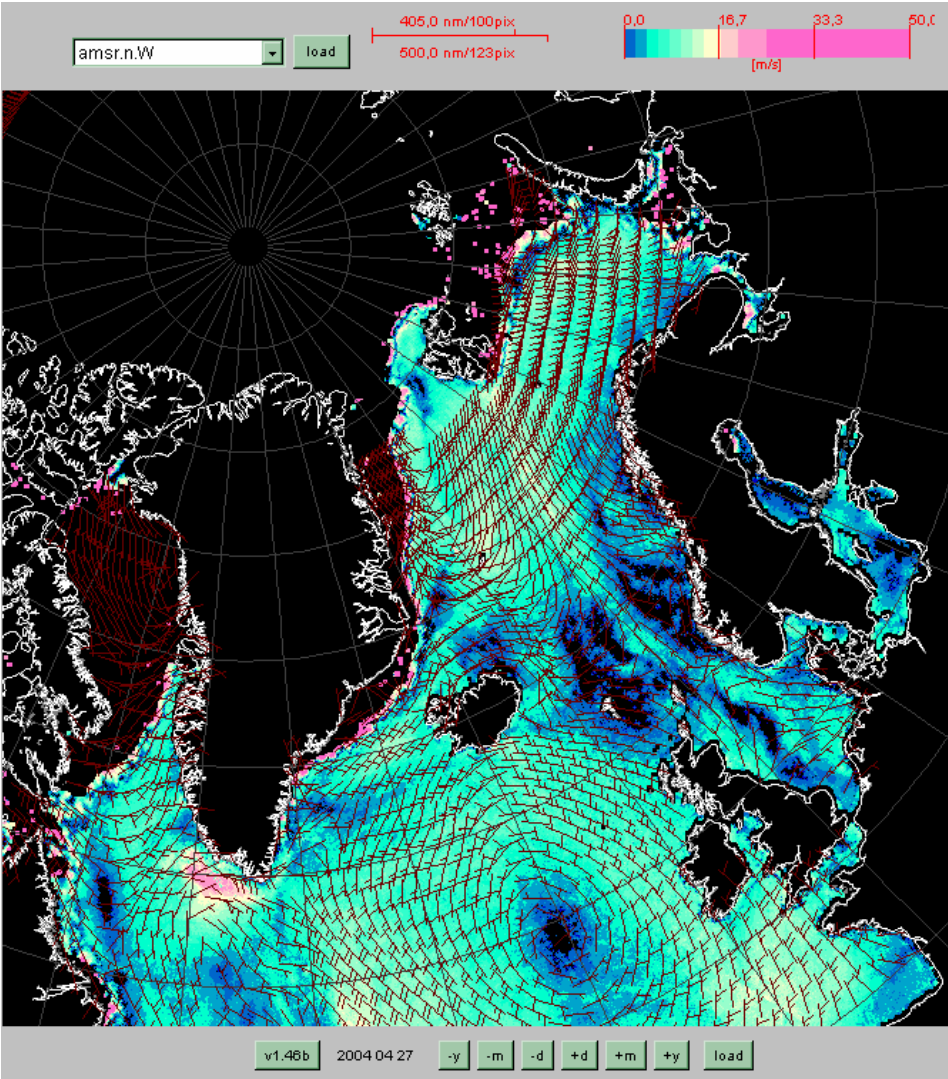
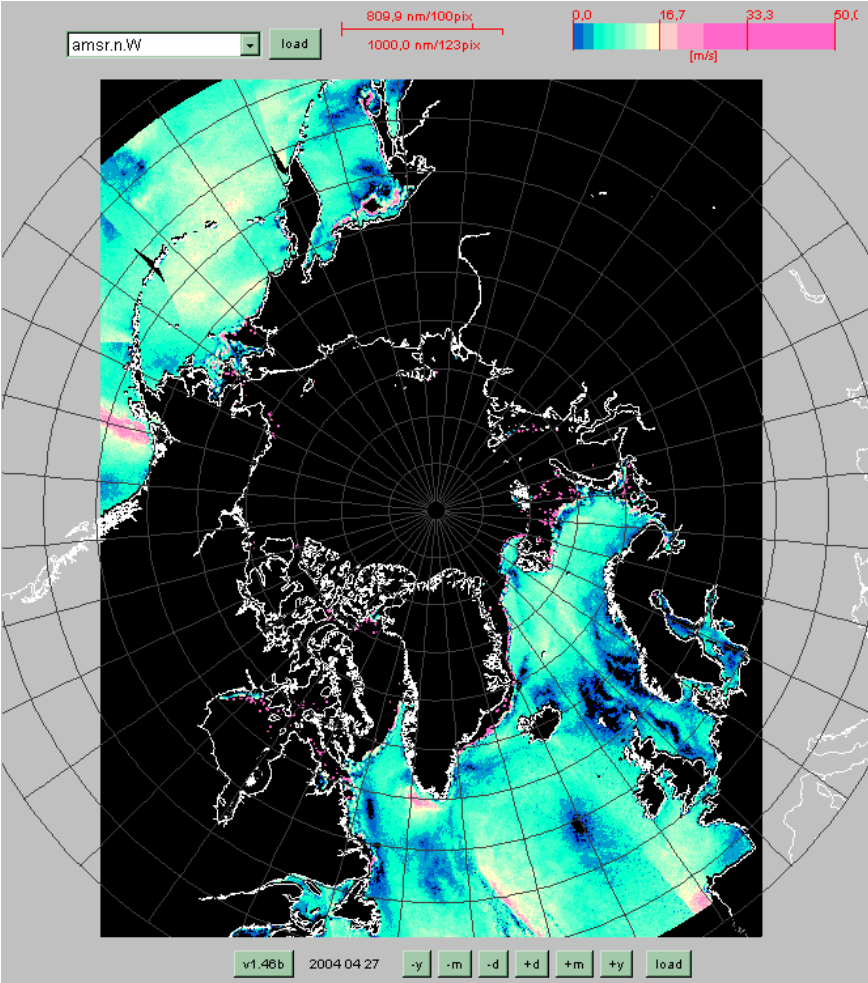
$$\hat{\mathbf{p}} = \hat{\mathbf{S}} (\mathbf{S}_p^{-1} \mathbf{p}_0 + \mathbf{M}^t \mathbf{S}_e^{-1} \mathbf{T}_A) \quad (7.13)$$



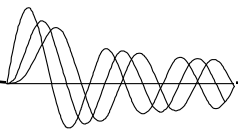
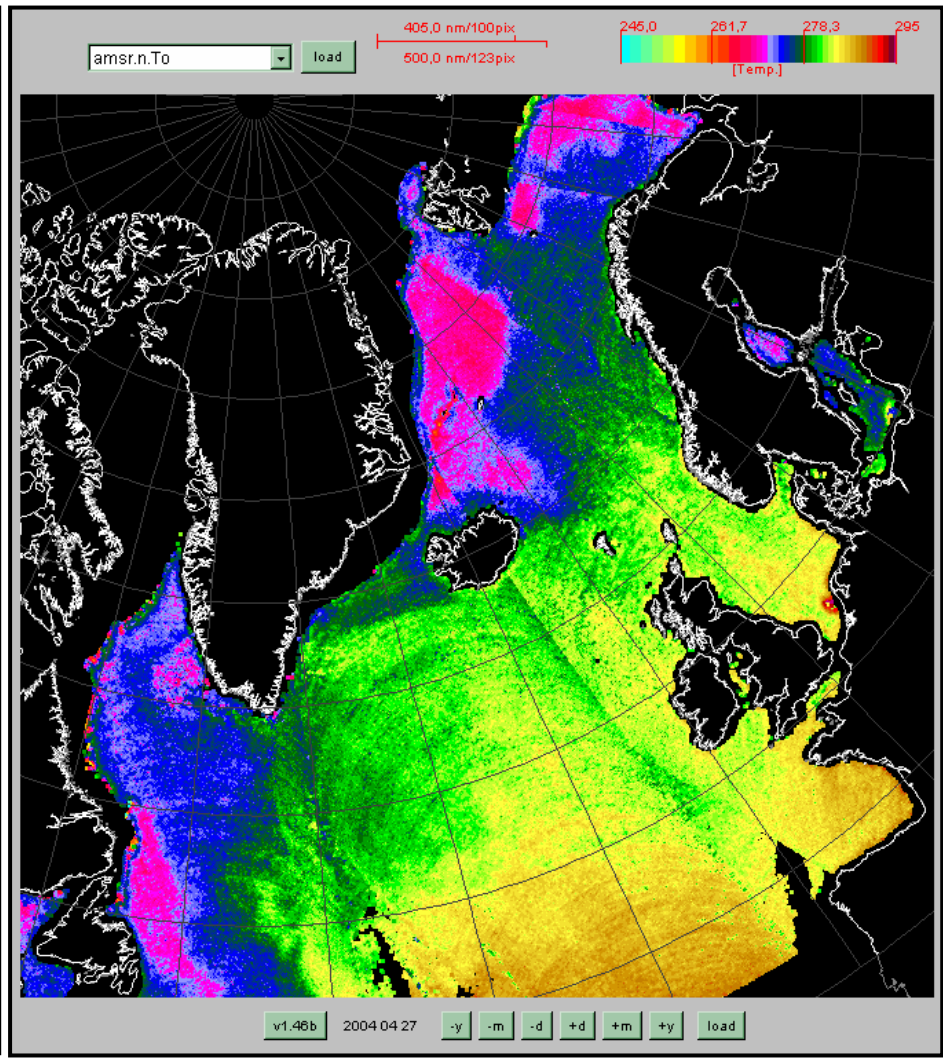
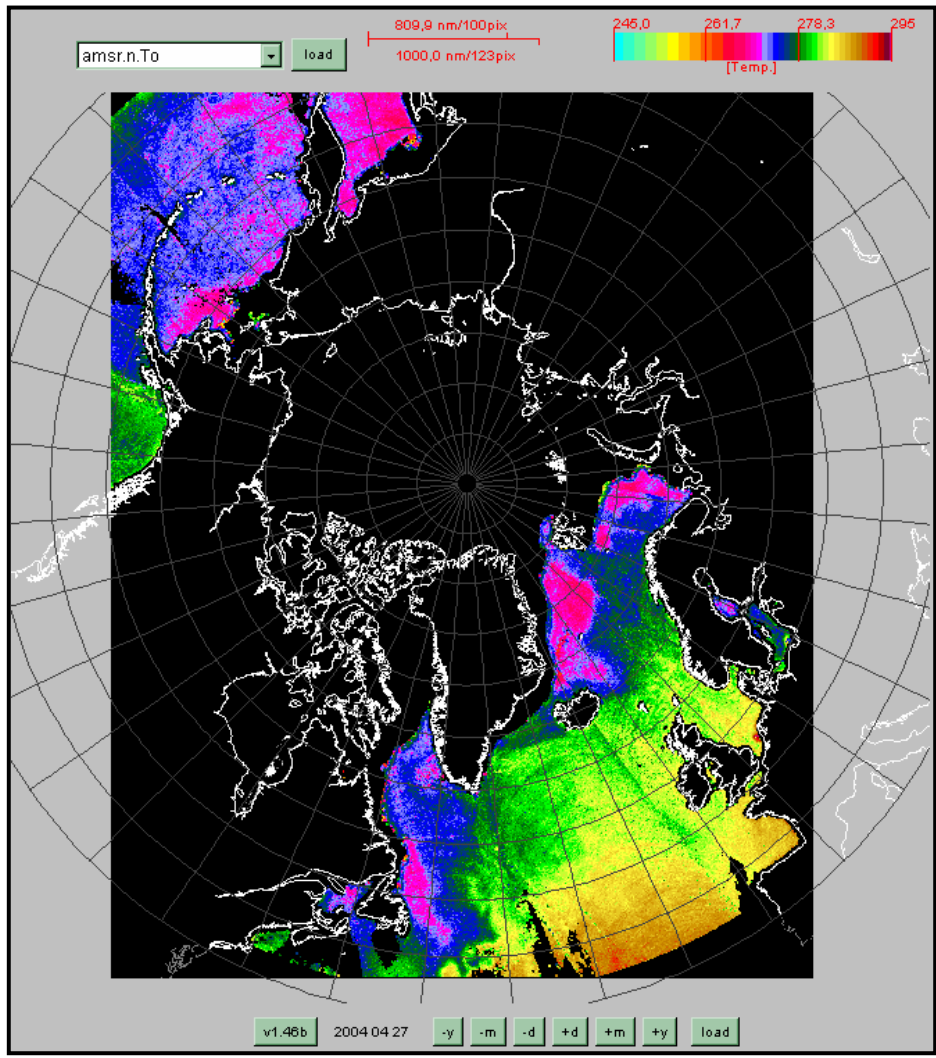
Cloud liquid water and water vapour 2004 04 27



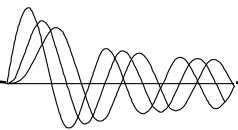
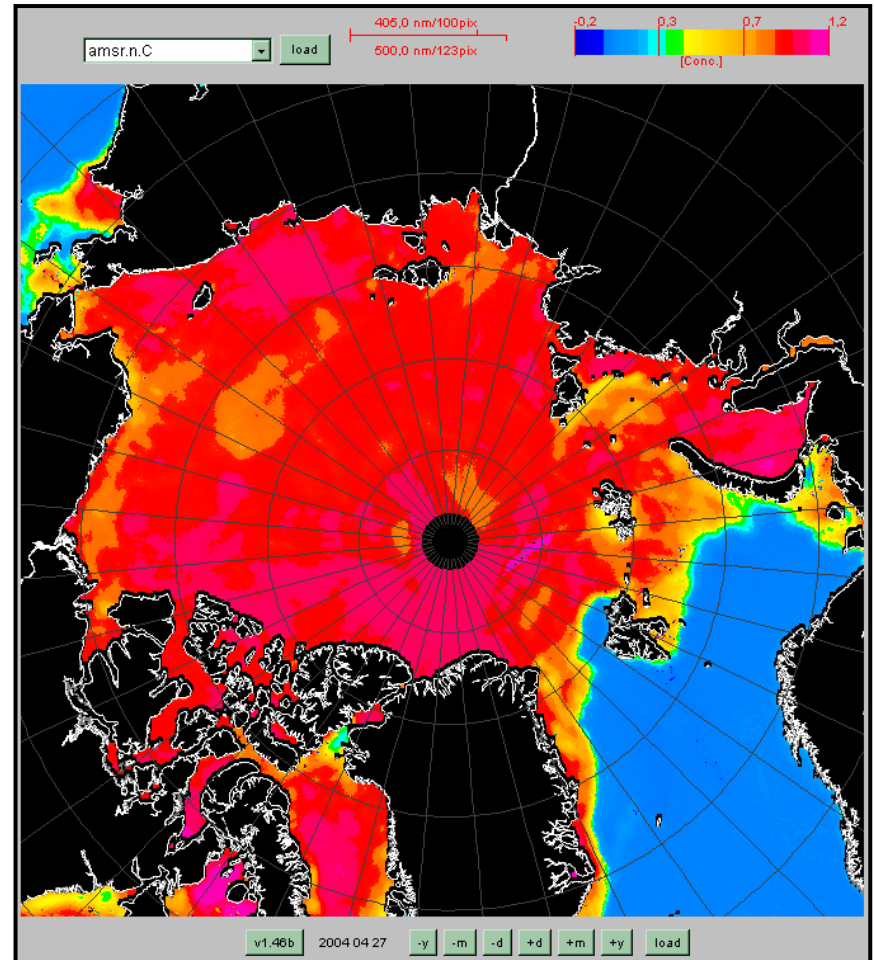
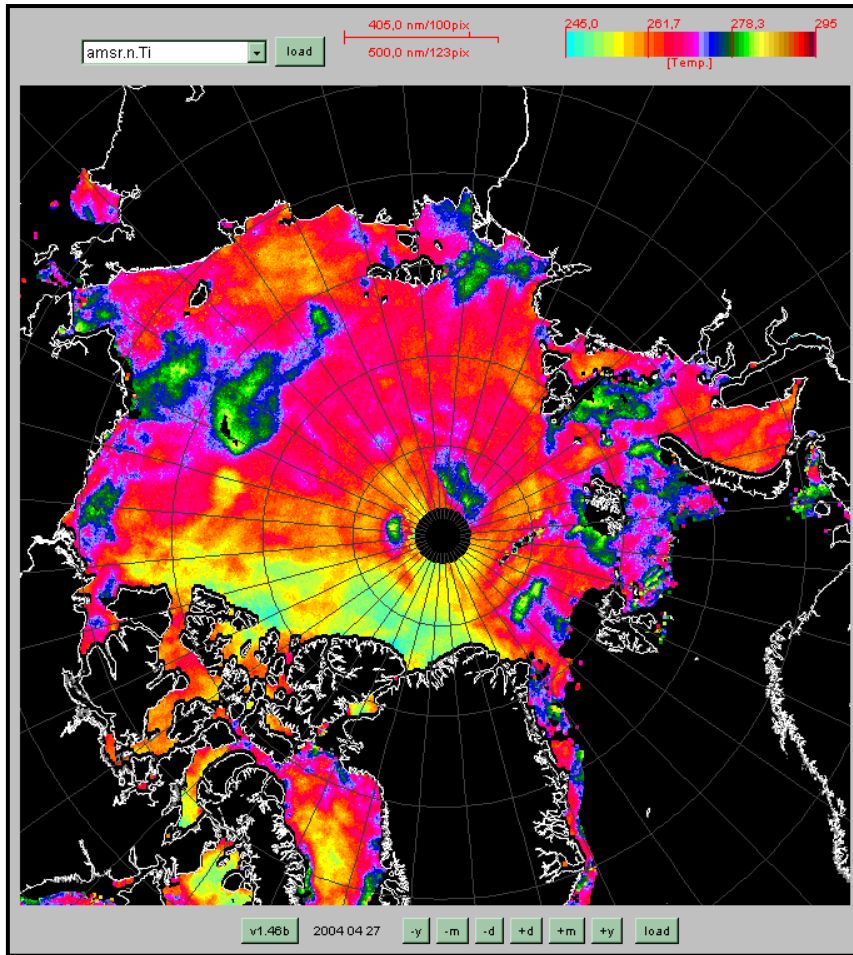
Wind speed 2004 04 27



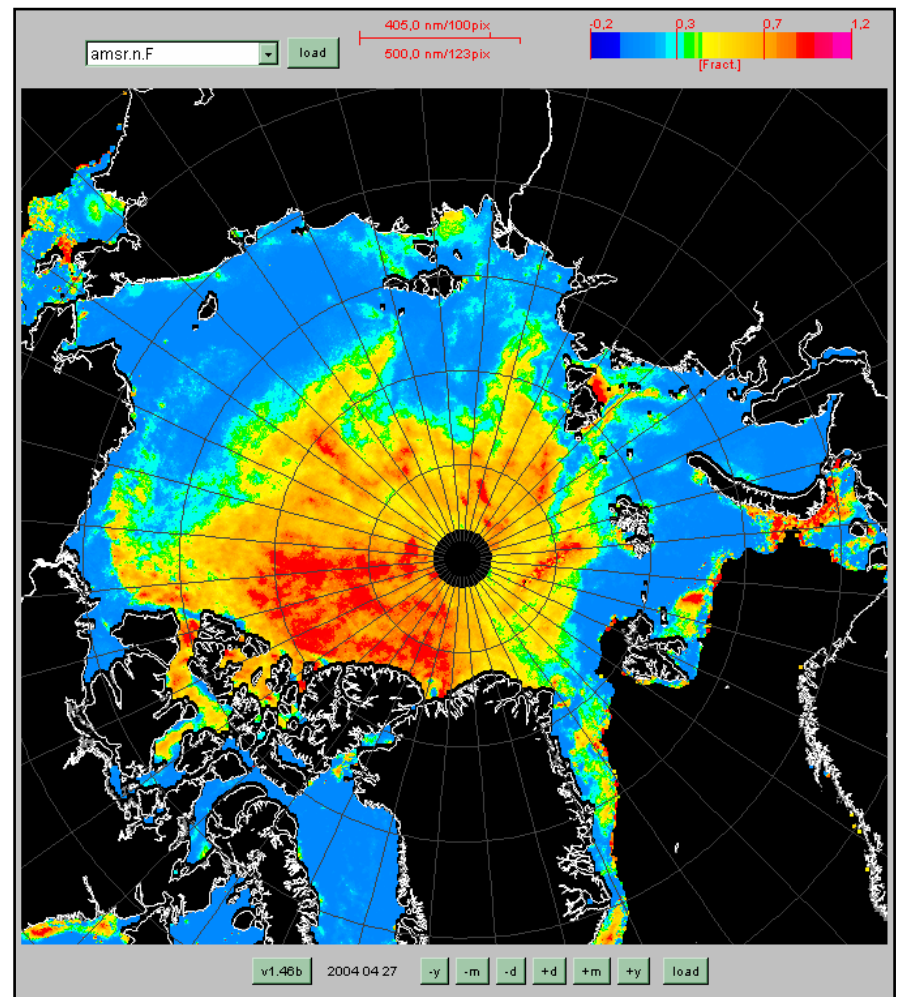
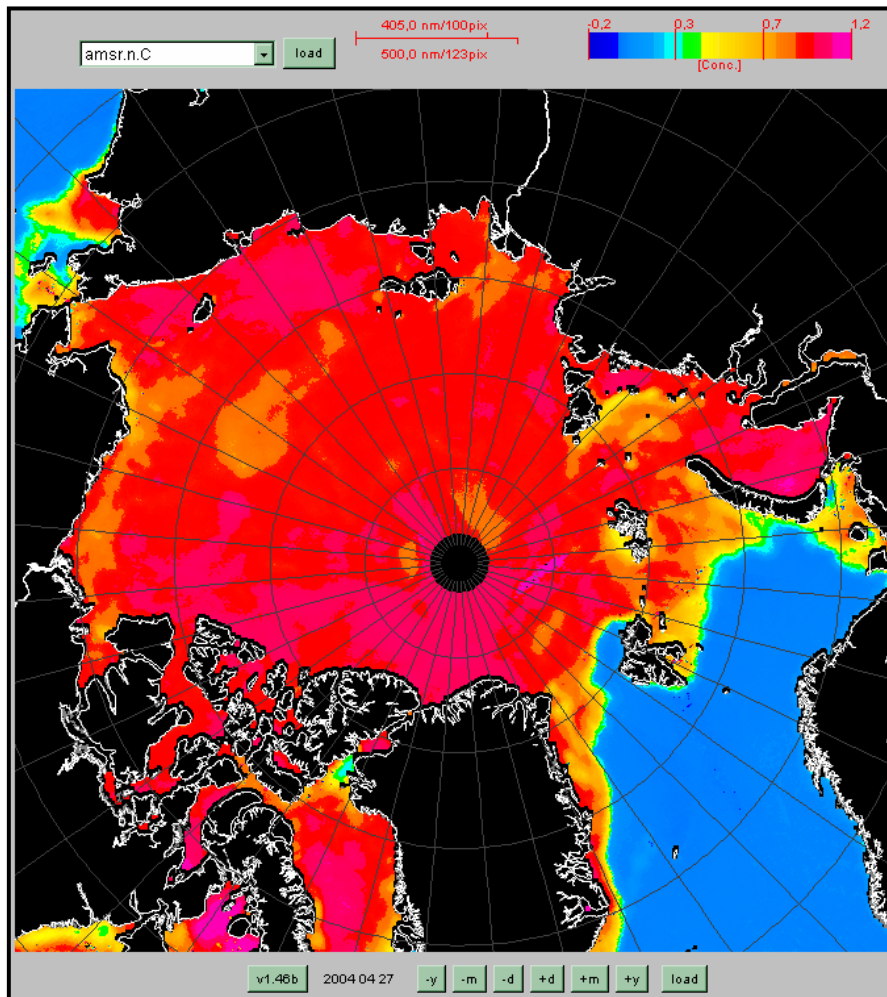
SST - 2004 04 27



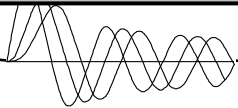
Ice temperature and ice concentration 2004 04 27



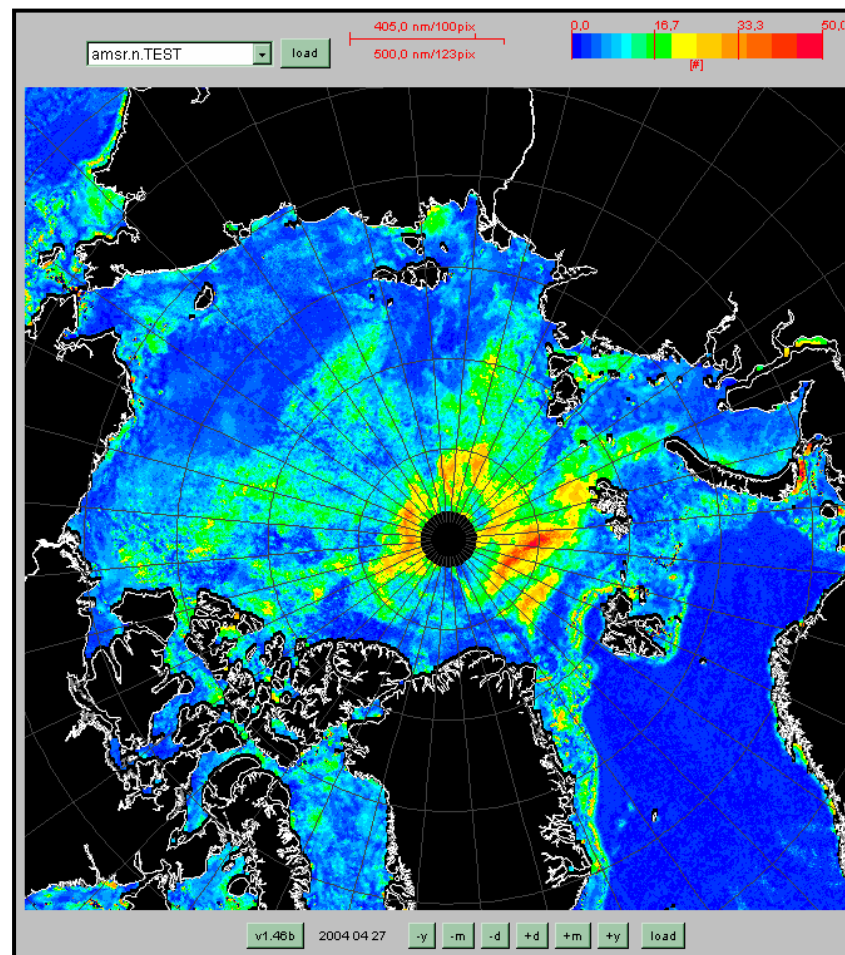
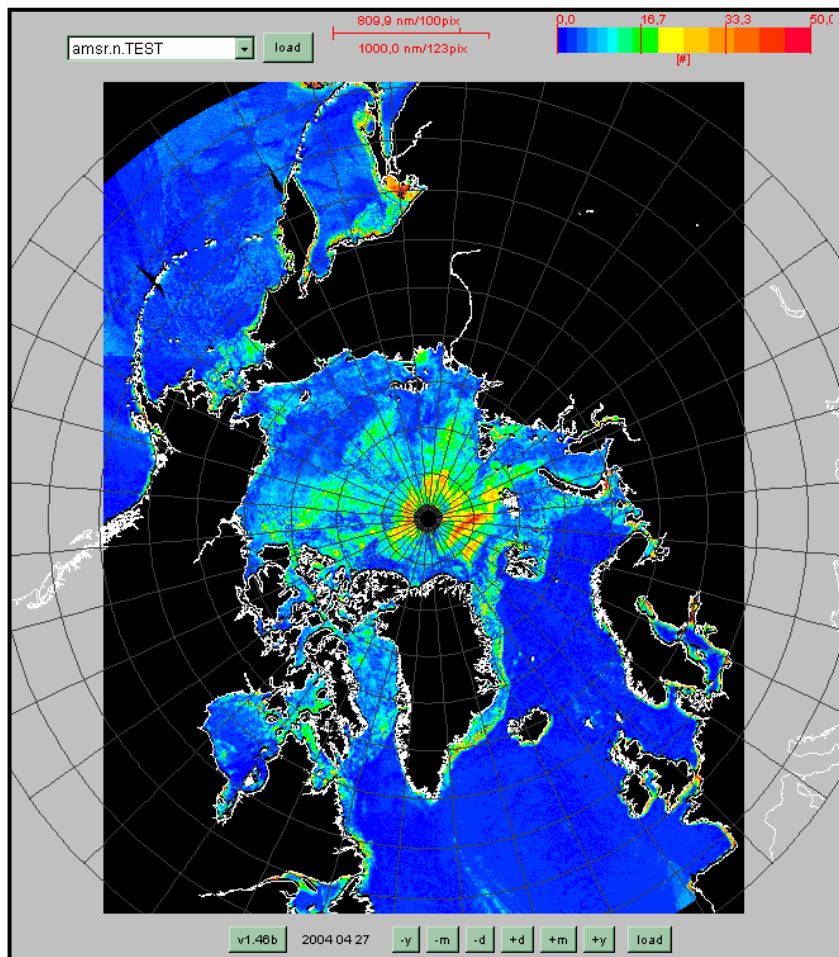
Ice concentration and MY-fraction 2004 04 27



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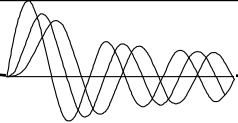
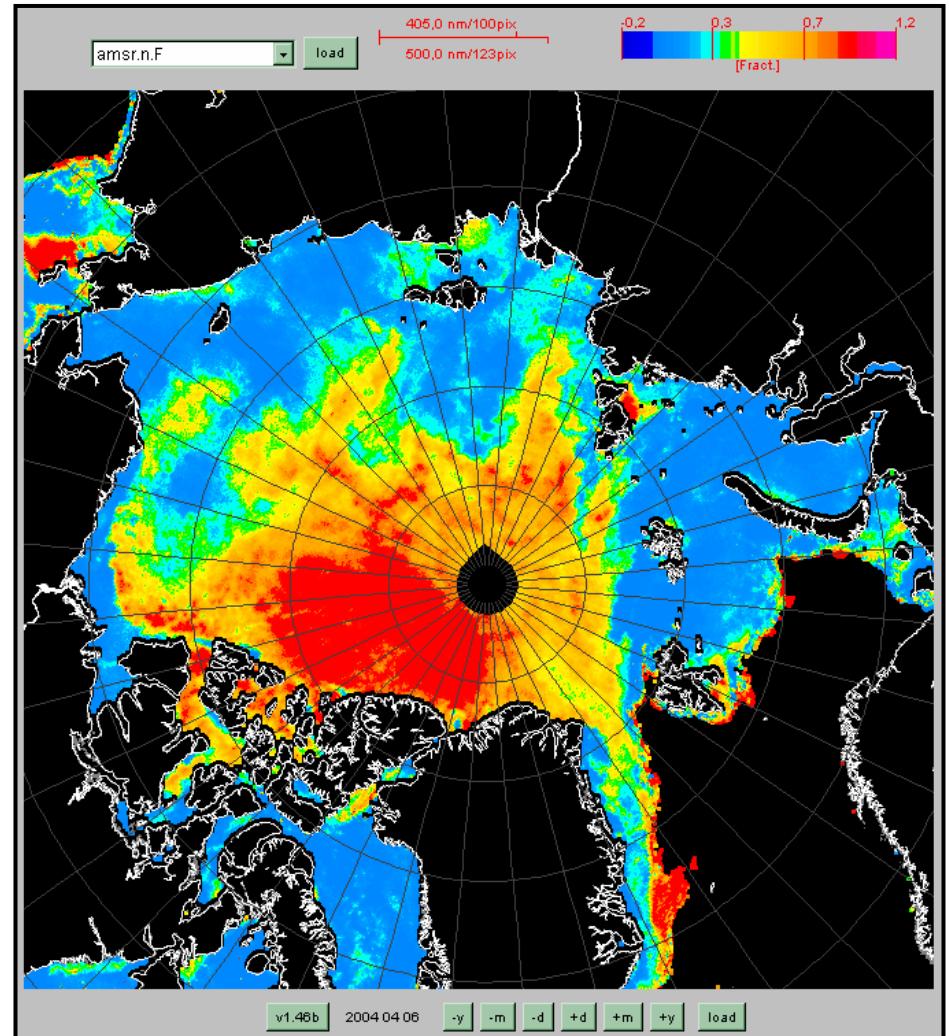
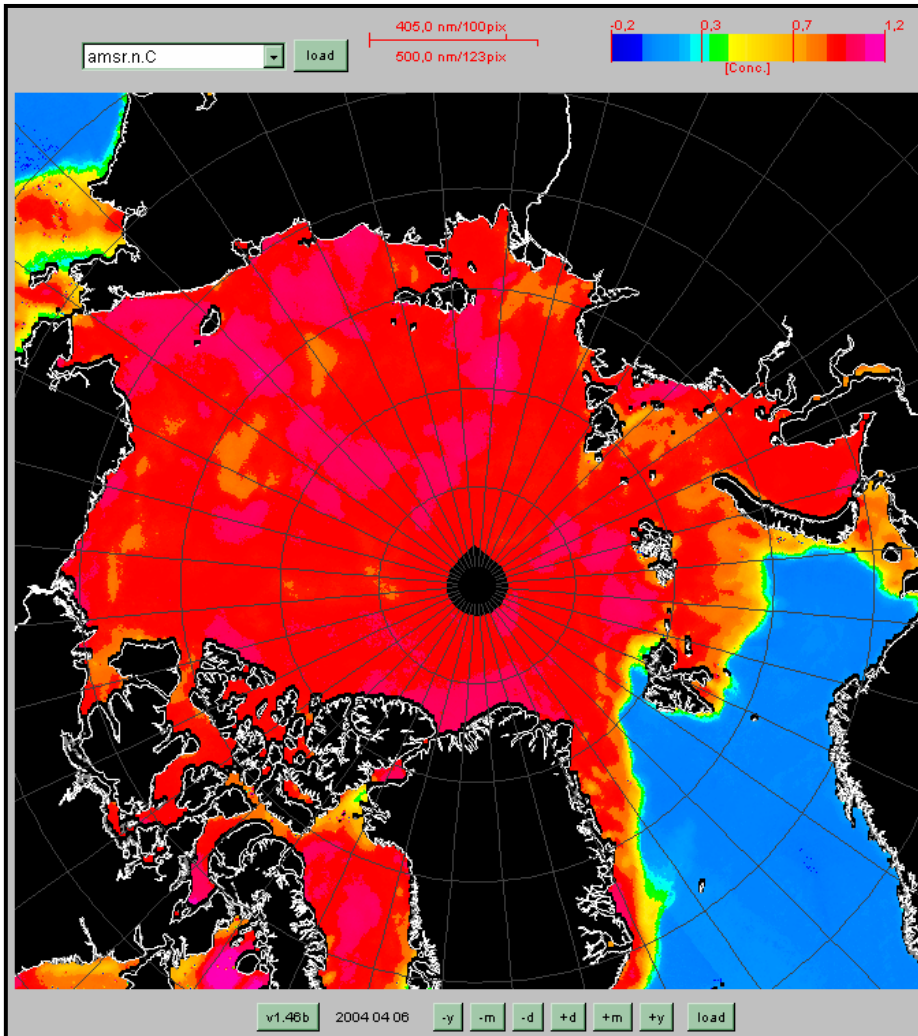


Error term - 2004 04 27



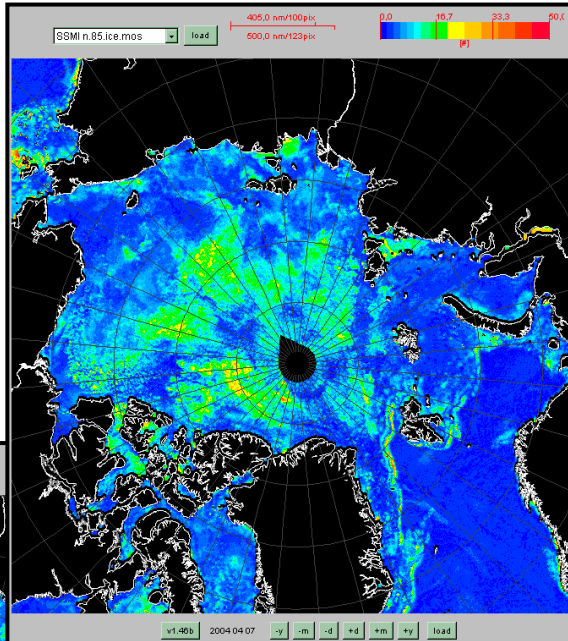
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Sea ice concentration and MY-fraction 2004 04 06

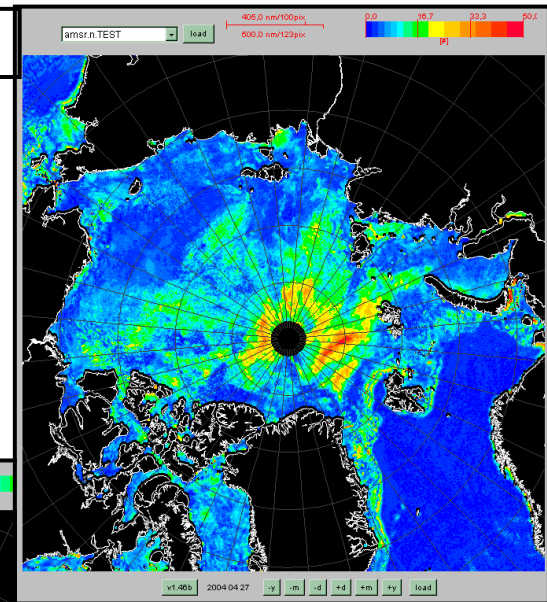


Error term during April 2004

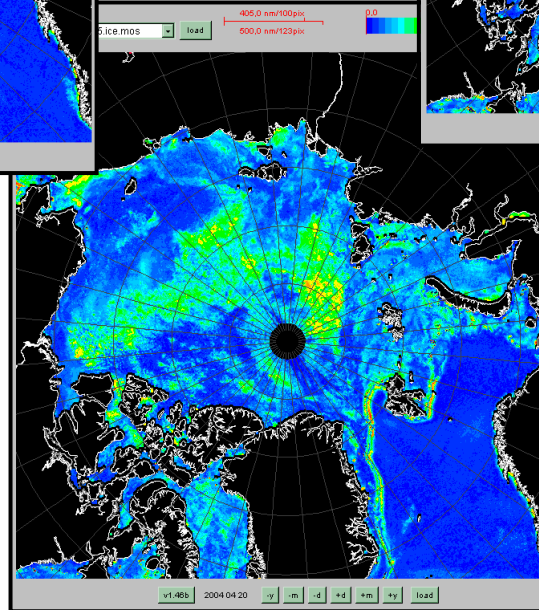
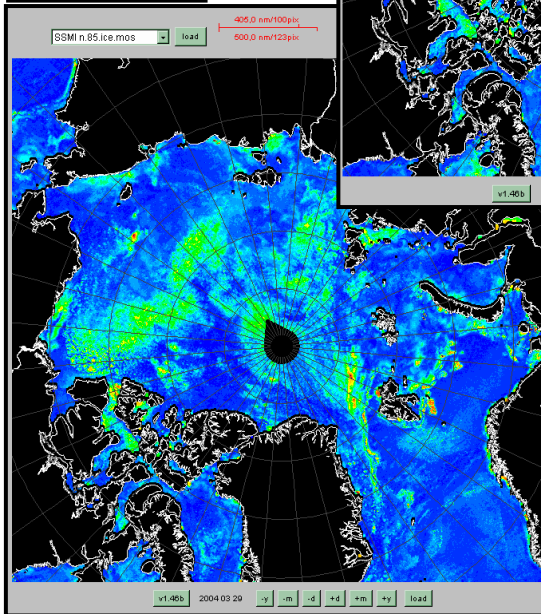
April 7



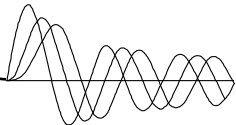
April 27



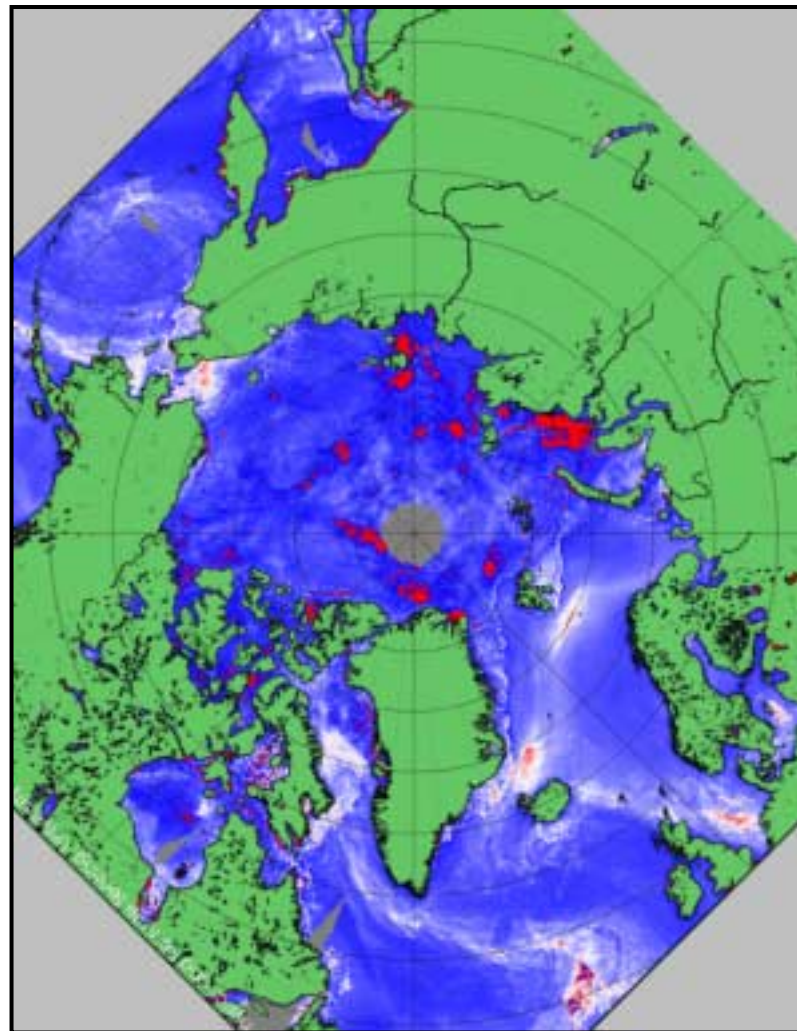
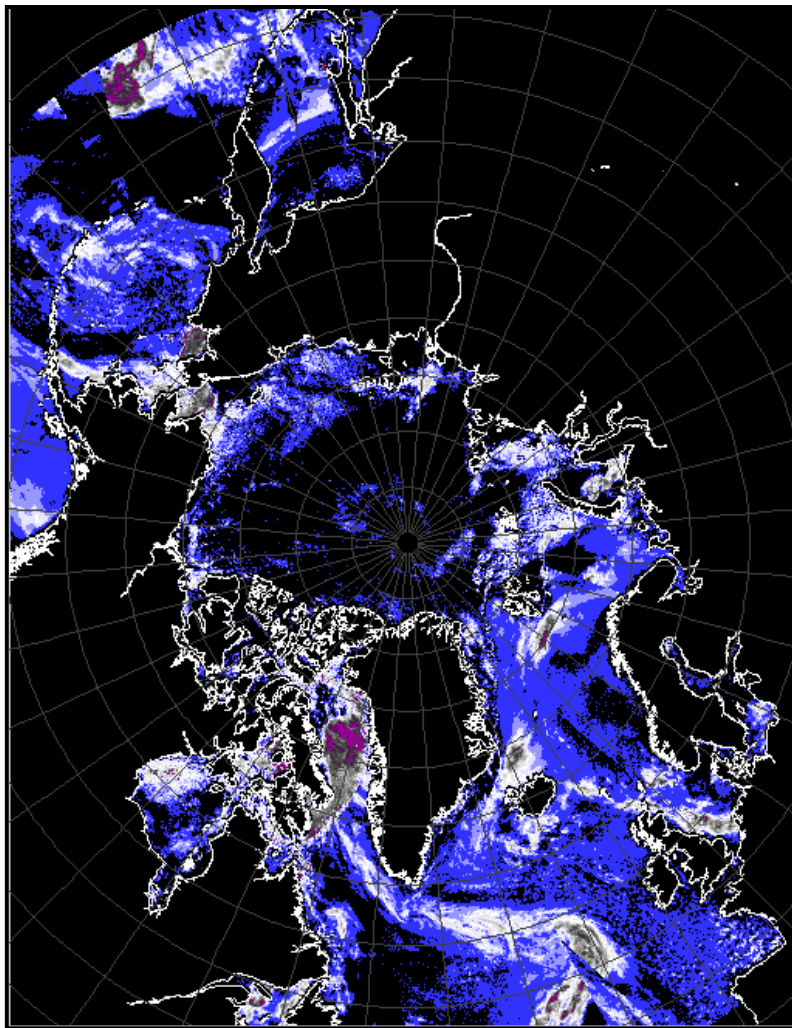
March 29



April 20

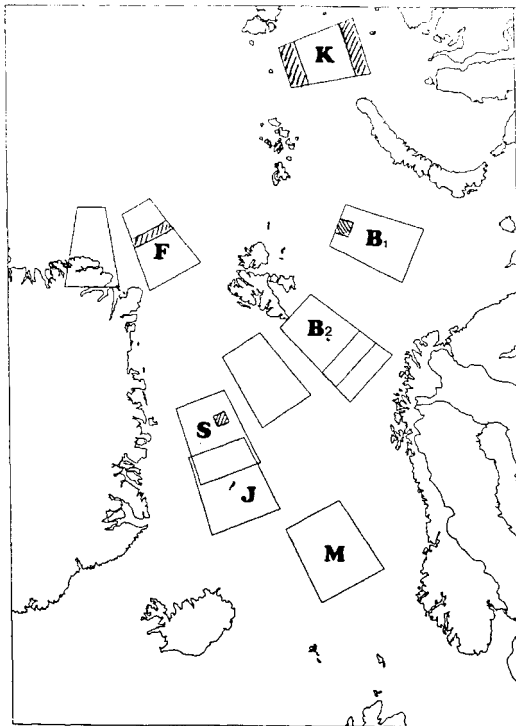


CLW and R-factor 2004 05 07

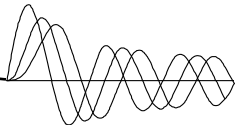


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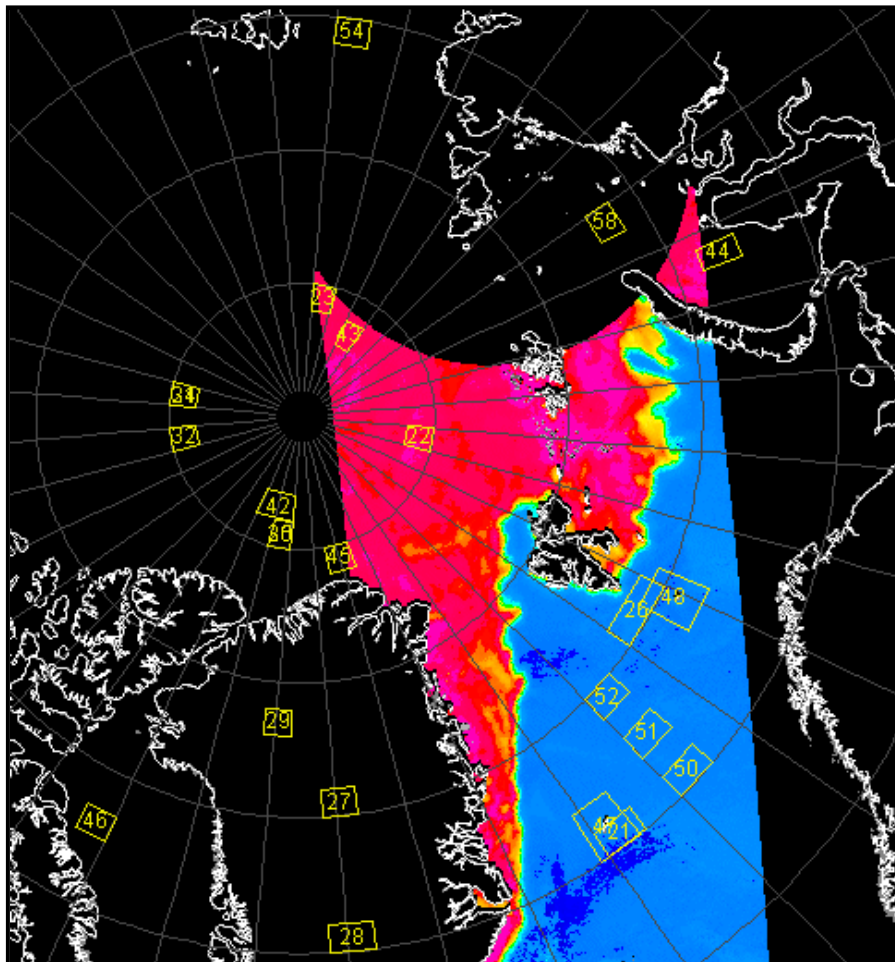
Algorithm performance



N	Algorithm	MIKE	MIKE	Baren	GS	Kara-	Kara-	Fram	Fram	Fram	Fram
		JAN	JUL	t	JAN	S	N	FEB	APR	AUG	OCT
1	Simple 6.6 GHz	1.0	-1.2	95.4	81.0	84.0	86.6	84.5	89.7	71.1	83.3
3	Simple 18 H+V	-2.1	-1.9	91.5	74.7	99.9	104.3	105.9	103.2	63.5	51.2
4	Simple 21 H+V	-8.1	18.8	93.5	70.5	91.4	93.6	100.0	103.1	83.1	80.6
5	Simple 37 H+V	-3.4	5.1	95.4	84.1	101.3	102.1	102.3	102.2	70.6	79.3
7	Cavalieri et al.	2.8	3.3	102.3	81.3	98.9	102.2	119.6	121.7	77.6	89.4
12	Comiso-Polarizati	-1.8	6.6	95.5	84.4	101.3	102.1	102.2	102.2	71.1	79.7
13	Comiso-Frequency	0.2	-1.3	96.1	80.9	86.7	87.7	96.0	101.3	79.4	96.4
1	Simple 6.6 GHz	2.2	1.2	2.3	4.5	1.5	1.0	1.1	0.9	9.9	2.8
3	Simple 18 H+V	7.2	7.6	3.6	11.3	3.4	4.2	2.7	4.2	9.8	13.4
4	Simple 21 H+V	15.5	14.6	7.0	11.2	6.3	6.3	2.9	3.8	7.5	6.0
5	Simple 37 H+V	10.4	11.7	3.6	6.7	3.0	3.6	1.9	3.2	10.2	6.5
7	Cavalieri et al.	2.8	1.8	3.5	6.3	1.6	2.6	1.8	4.2	18.7	8.9
12	Comiso-Polarizati	10.3	11.6	3.5	6.6	2.9	3.5	1.9	3.2	10.1	6.4
13	Comiso-Frequency	3.2	2.6	2.6	4.0	0.9	1.0	1.1	2.2	15.8	2.9
N		117	118	27	21	83	82	32	30	20	17



Ice concentration - no ice



	Total ice concentration		FY ice concentration		MY ice concentration	
	Mean	Std.	Mean	Std.	Mean	Std.
Our algorithm	0.0123	0.0405	0.0122	0.0404	0.0001	0.0015
NASA Team	0.0636	0.0614	0.1359	0.1648	-0.0722	0.1206

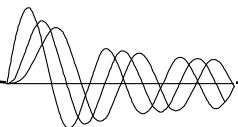
Table 4-3 The table shows the mean and standard deviation for each algorithm for area 50.

	Total ice concentration		FY ice concentration		MY ice concentration	
	Mean	Std.	Mean	Std.	Mean	Std.
Our algorithm	0.0088	0.0391	0.0001	0.0042	0.0087	0.0388
NASA Team	0.0527	0.0626	-0.0793	0.1186	0.1320	0.1597

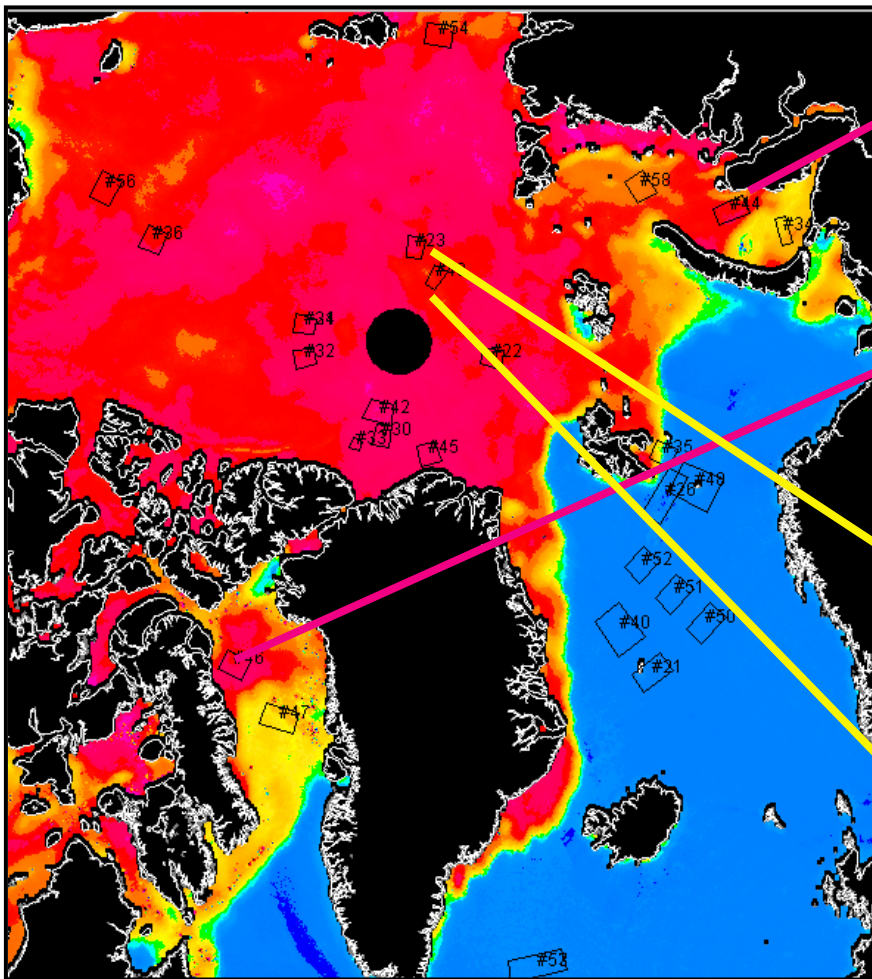
Table 4-4 The table shows the mean and standard deviation for each algorithm for area 51.

	Total ice concentration		FY ice concentration		MY ice concentration	
	Mean	Std.	Mean	Std.	Mean	Std.
Our algorithm	0.0018	0.0274	0.0013	0.0269	0.0005	0.0028
NASA Team	0.0274	0.0509	0.0836	0.1302	-0.0563	0.0976

Table 4-5 The table shows the mean and standard deviation for each algorithm for area 52.



Ice concentration - FY and MY ice



	Total ice concentration		FY ice concentration		MY ice concentration	
	Mean	Std.	Mean	Std.	Mean	Std.
Our algorithm	1.0166	0.1528	0.6524	0.3380	0.3642	0.2878
NASA Team	0.8646	0.1161	0.8177	0.1683	0.0428	0.0780

Table 4-7 The table shows the mean and standard deviation for each algorithm for area 44 (FY area).

	Total ice concentration		FY ice concentration		MY ice concentration	
	Mean	Std.	Mean	Std.	Mean	Std.
Our algorithm	0.9981	0.1273	0.6806	0.2960	0.3175	0.2801
NASA Team	0.8333	0.1214	0.7157	0.1586	0.1177	0.0701

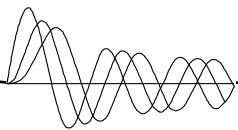
Table 4-8 The table shows the mean and standard deviation for each algorithm for area 46 (FY area).

	Total ice concentration		FY ice concentration		MY ice concentration	
	Mean	Std.	Mean	Std.	Mean	Std.
Our algorithm	1.0152	0.0673	0.2034	0.1515	0.8118	0.1095
NASA Team	0.9220	0.0599	0.3179	0.1214	0.6041	0.0987

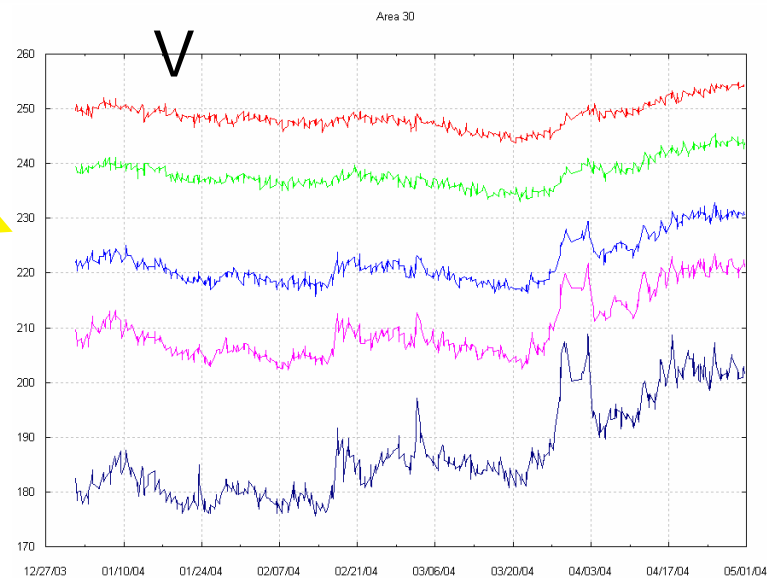
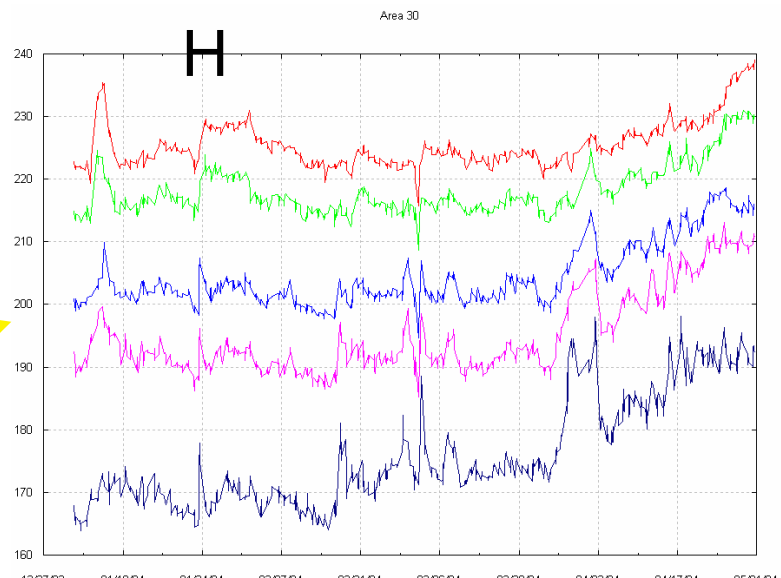
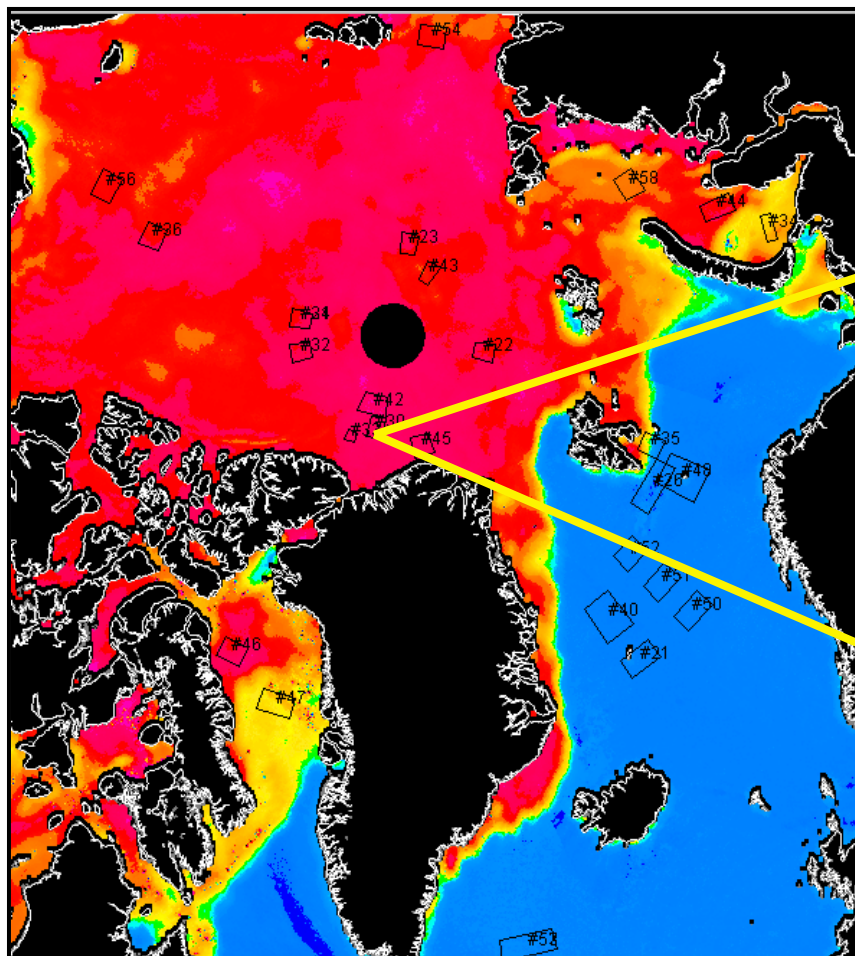
Table 4-9 The table shows the mean and standard deviation for each algorithm for area 23 (MY area).

	Total ice concentration		FY ice concentration		MY ice concentration	
	Mean	Std.	Mean	Std.	Mean	Std.
Our algorithm	1.0337	0.0421	0.1193	0.1132	0.9144	0.0964
NASA Team	0.9527	0.0492	0.3853	0.0911	0.5674	0.0782

Table 4-10 The table shows the mean and standard deviation for each algorithm for area 43 (MY area).

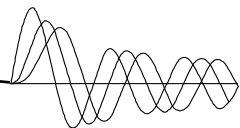


Time series AMSR MY-ice

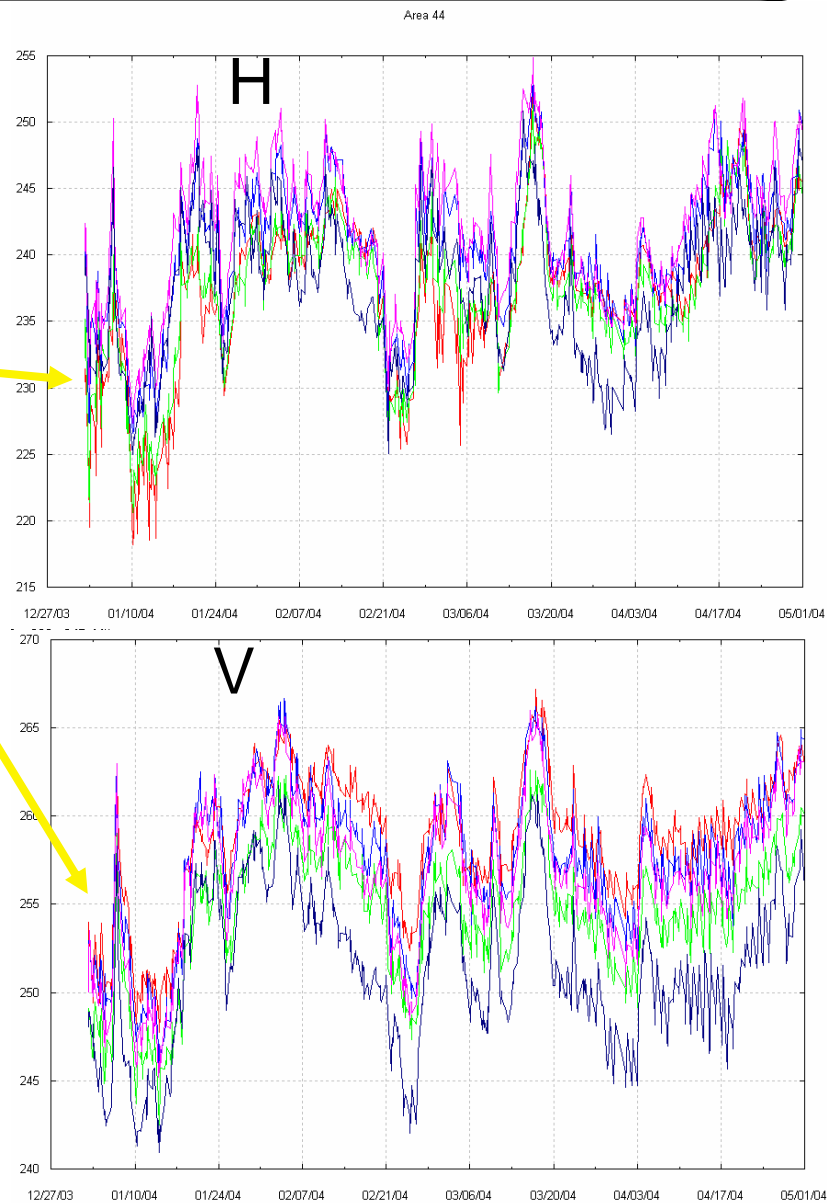
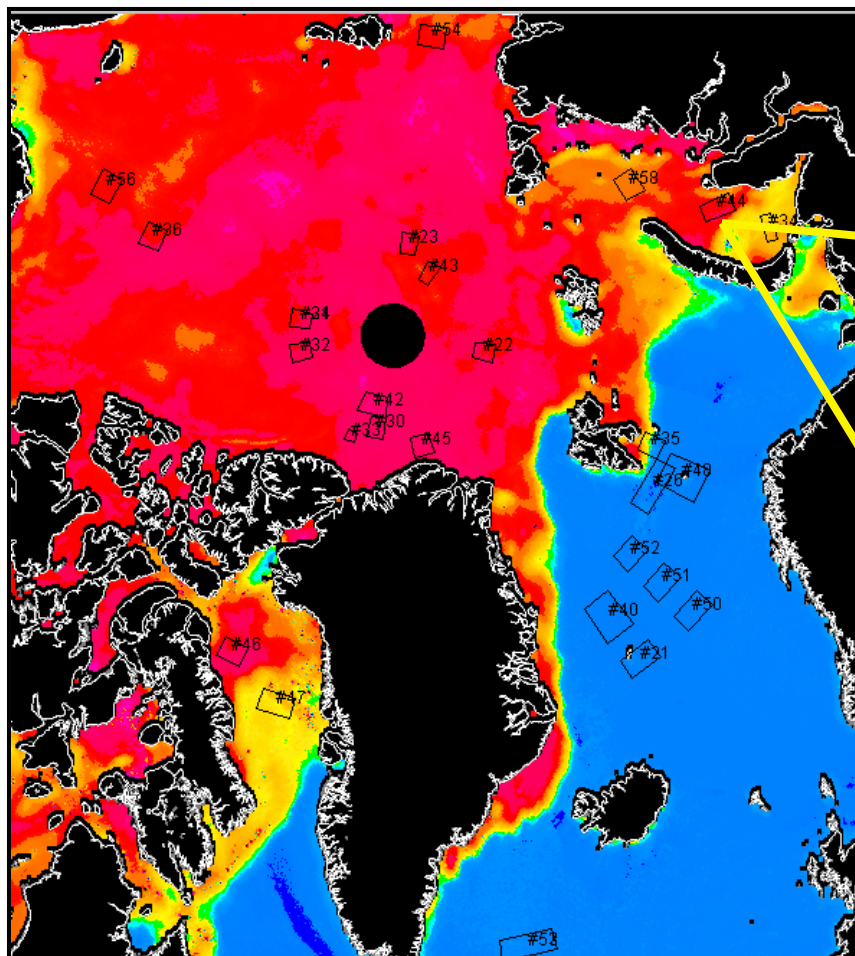


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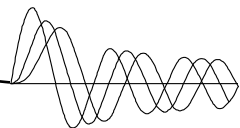
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Time series AMSR FY-ice



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AMSU-A Area 44

