SAROPS
Environmental Data Sources
Their Uncertainties

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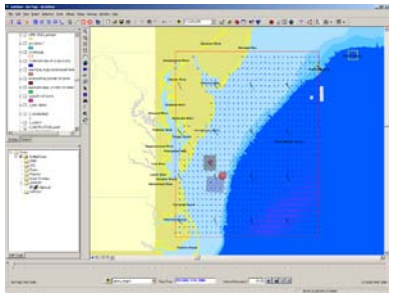
EDS Architecture

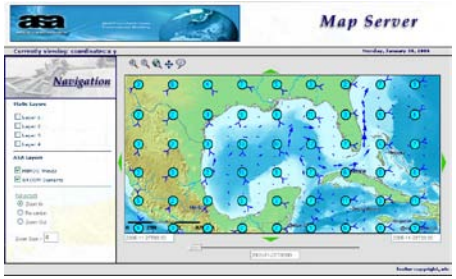


USCG SWIII

USCG SWIII

RDP

RDP



Terminal Server
w/SAROPS Client

Web Service XML Request

NetCDF Data

- Data Service
- Spatial Aggregation Service
- Temporal Aggregation Service
- Objective Analysis

Web Services

Winds

Currents

Drifters

Weather

Environmental
Database

Catalog Server

Catalog

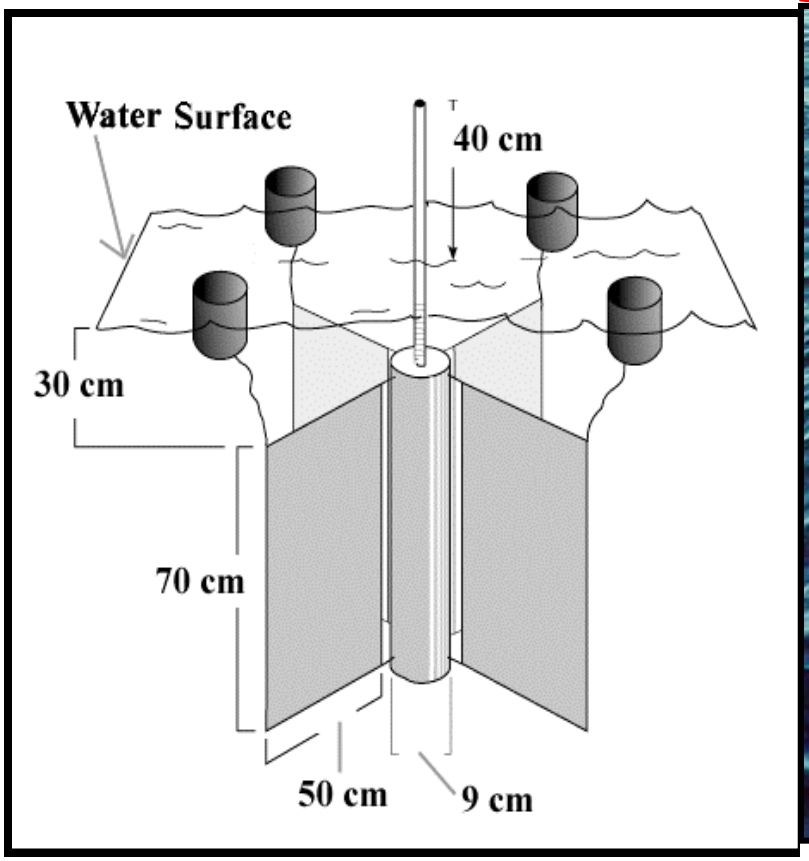
NOAA products & services used by SAROPS

- NCEP North Atlantic HYCOM currents
- Navy NAVO NCOM currents (via NCDDC)
- GLERL/NOS Great Lakes currents
- NCEP GFS winds
- NCEP NAM winds
- NDBC moored buoys / C-MAN winds
- NOS NOWCOAST shape files - weather
- Nautical Charts
- GSHHS shoreline

EDS Current Products

- Navy NAVO (via NCDDC) NCOM
- NOAA NCEP North Atlantic HYCOM
- NOAA GLERL/NOS Great Lakes currents
- ADCIRC East and West
- Navy FNMOC CASP currents
- Mariano Seasonal Ship drift
- Florida Current Data File
- USCG SLDMBs

Davis/ CODE drifter Self-Locating Datum Marker Buoys (SLDMB)



“Trajectory Prediction using HF Radar Surface Currents: Monte Carlo Simulation of Prediction Uncertainties”

- Ullman, O’Donnell, Kohut, Fake and Allen
- JGR (in press)
- Hourly drifter velocity from -30 and+30 minute positions
- U’ = Drifter U – Product U
- Best exponential decay fit to Auto covariance U’,V’

Data processing

1) 105 SLDMB clean records

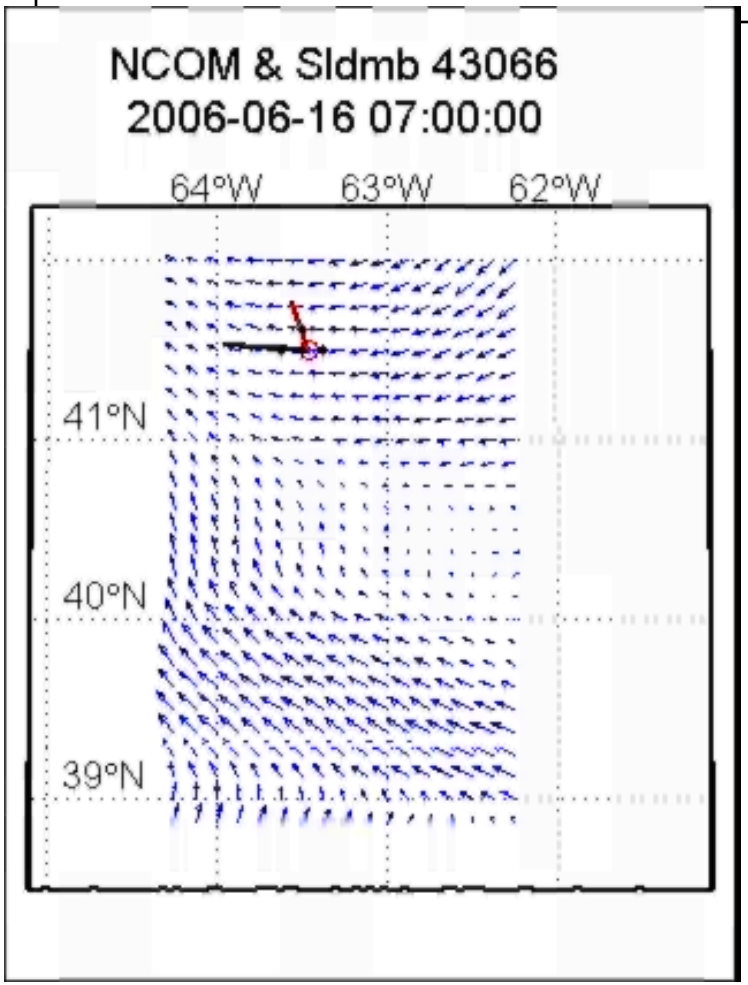
   - 4 to 30 days
   - 1 Jan – 30 June 2006

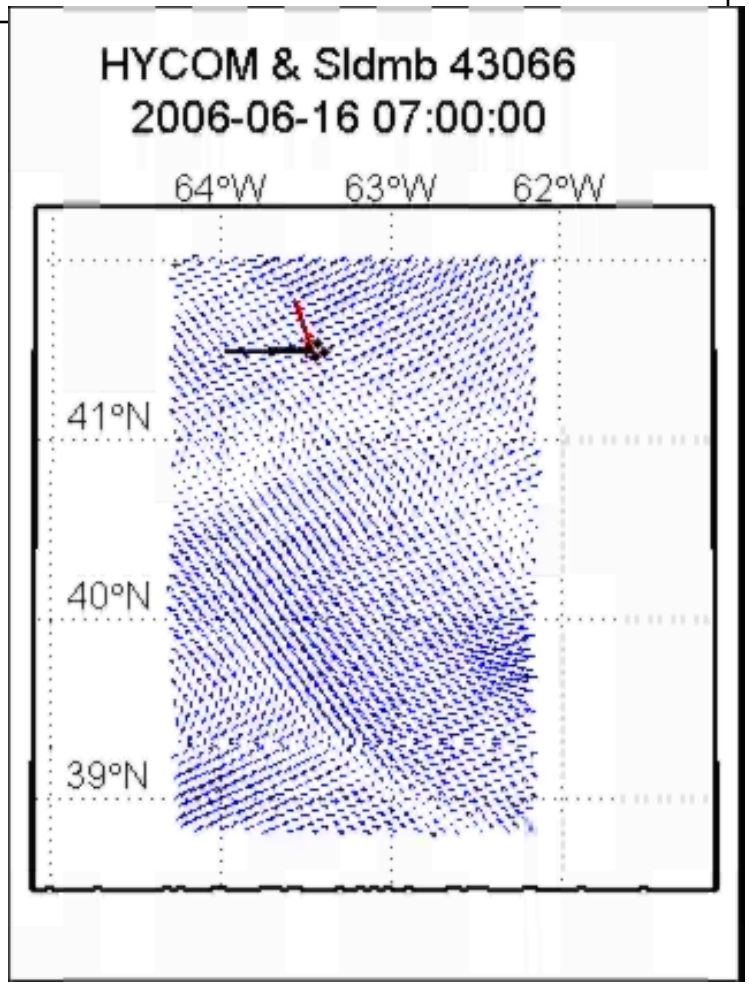
2) Find 4 closest EDS vectors to SLDMB's positions at each hour

3) Follow Ullman et al.

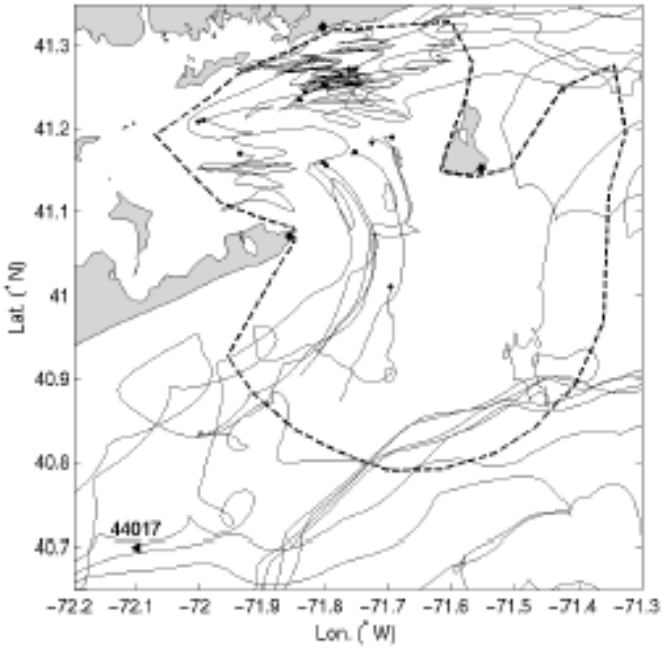
SLDMB comparisons

NCOM / HYCOM

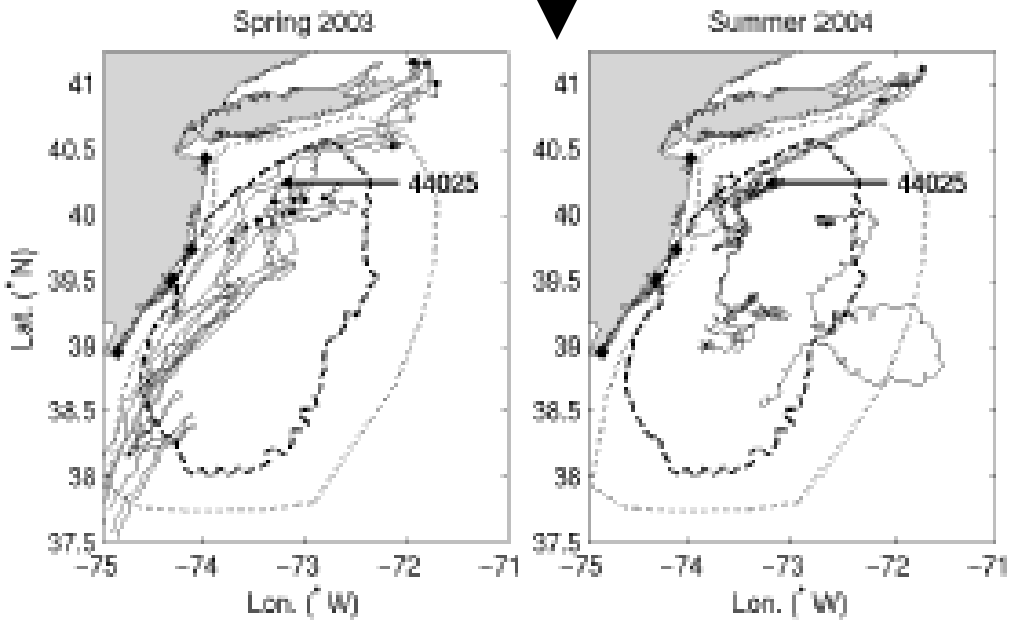




Ullman et al
HF Surface Wave Radar

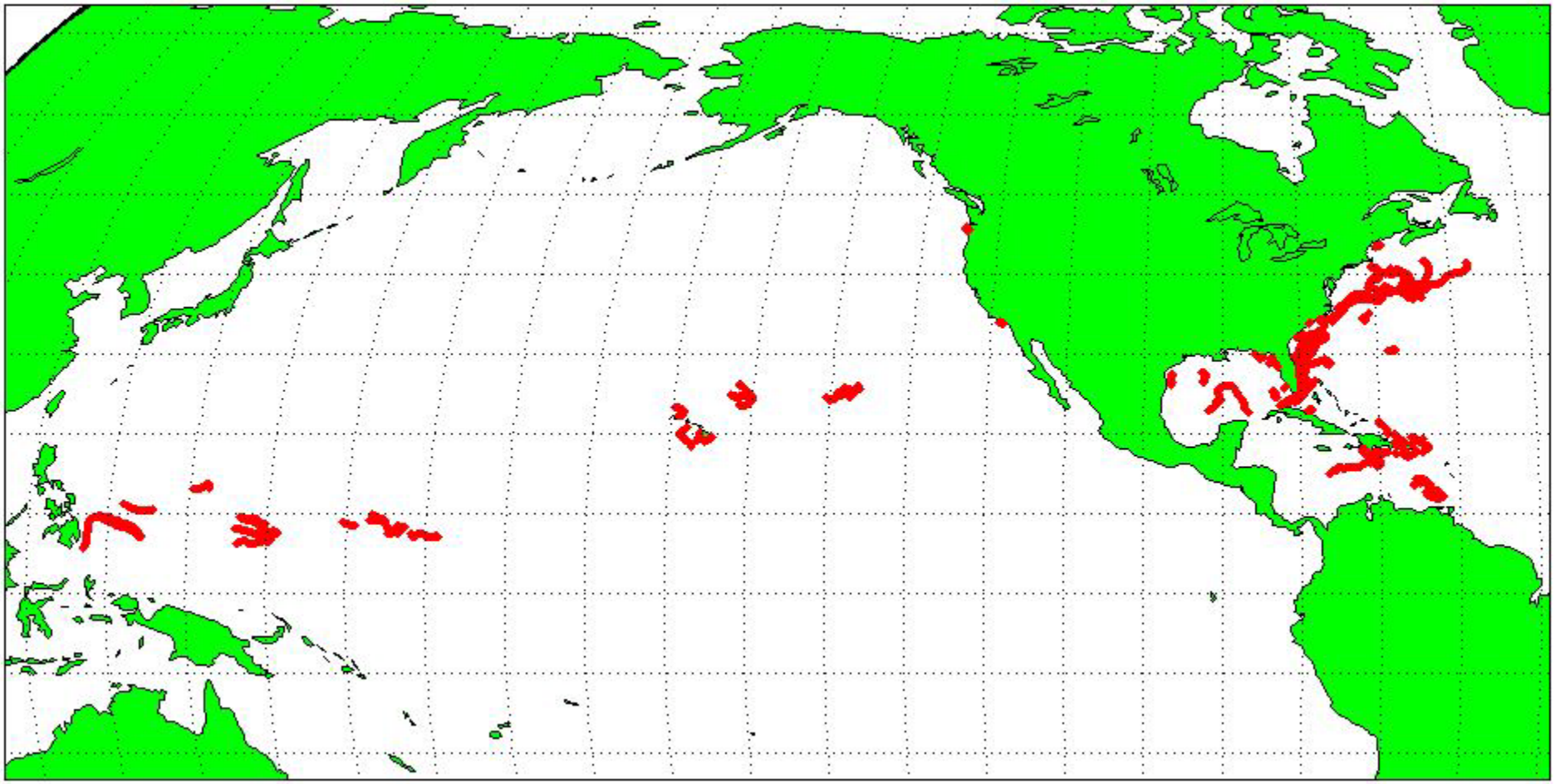


Long Range (NJ coast)

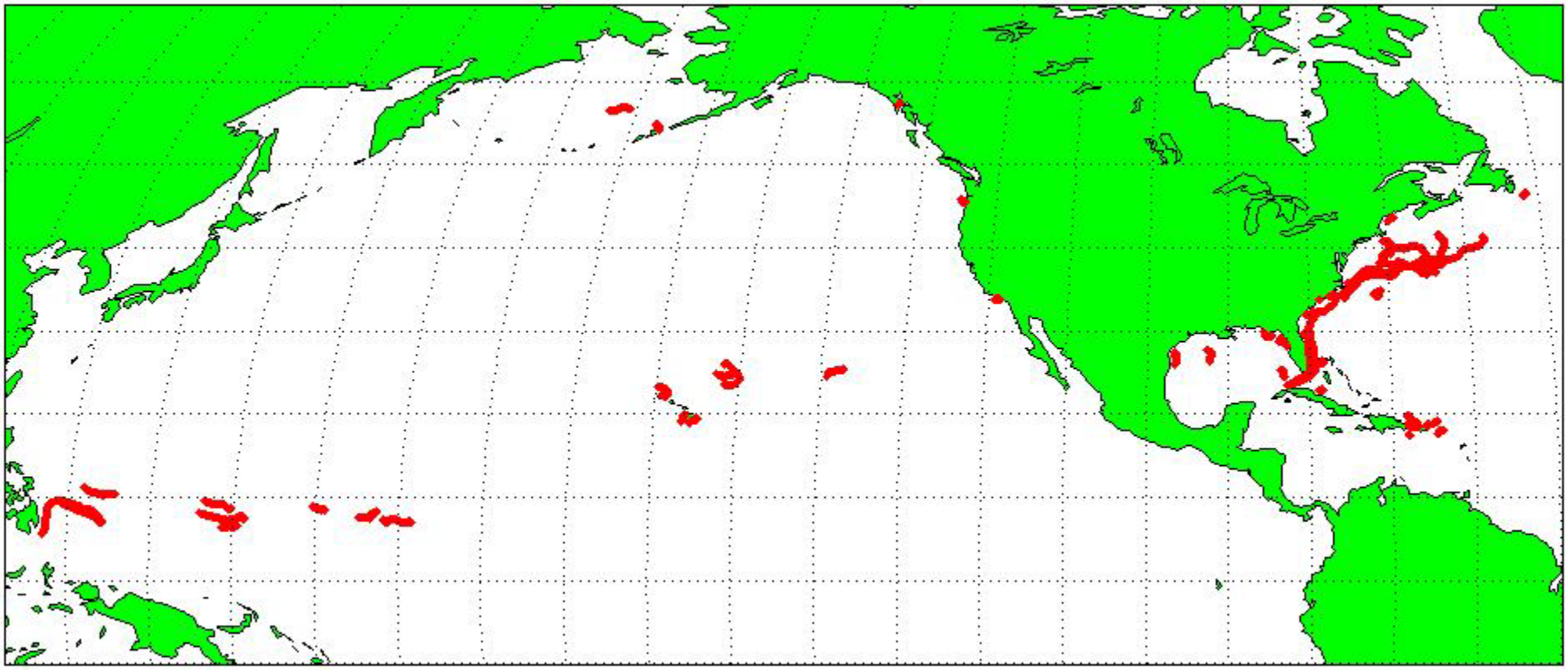


Standard (Block Island Sound)

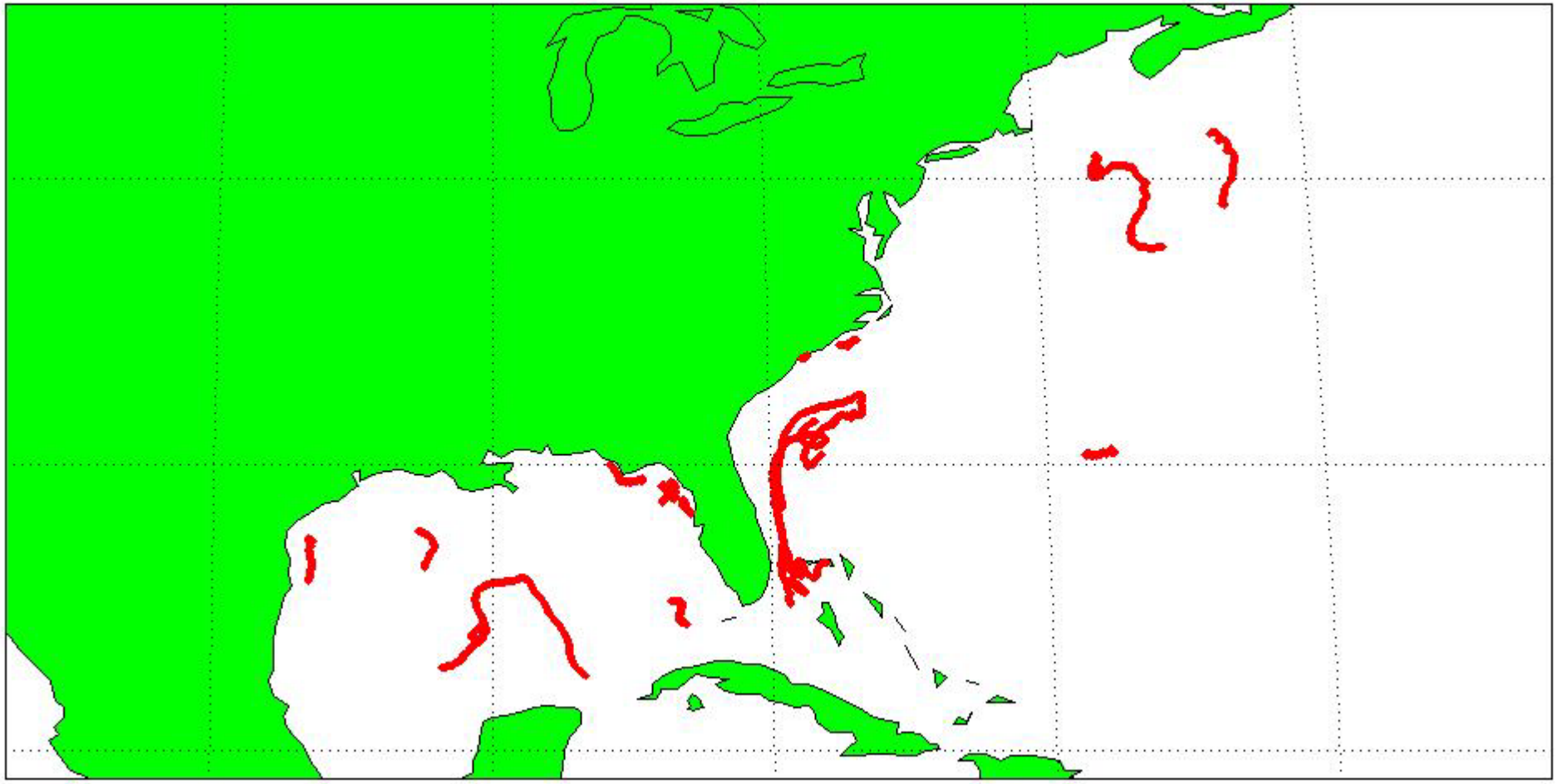
Mariano
Seasonal ship-set & drift
82 SLDMBs 28,013 hr



Navy's Global NCOM surface currents 61 SLDMBs 14,359 hrs



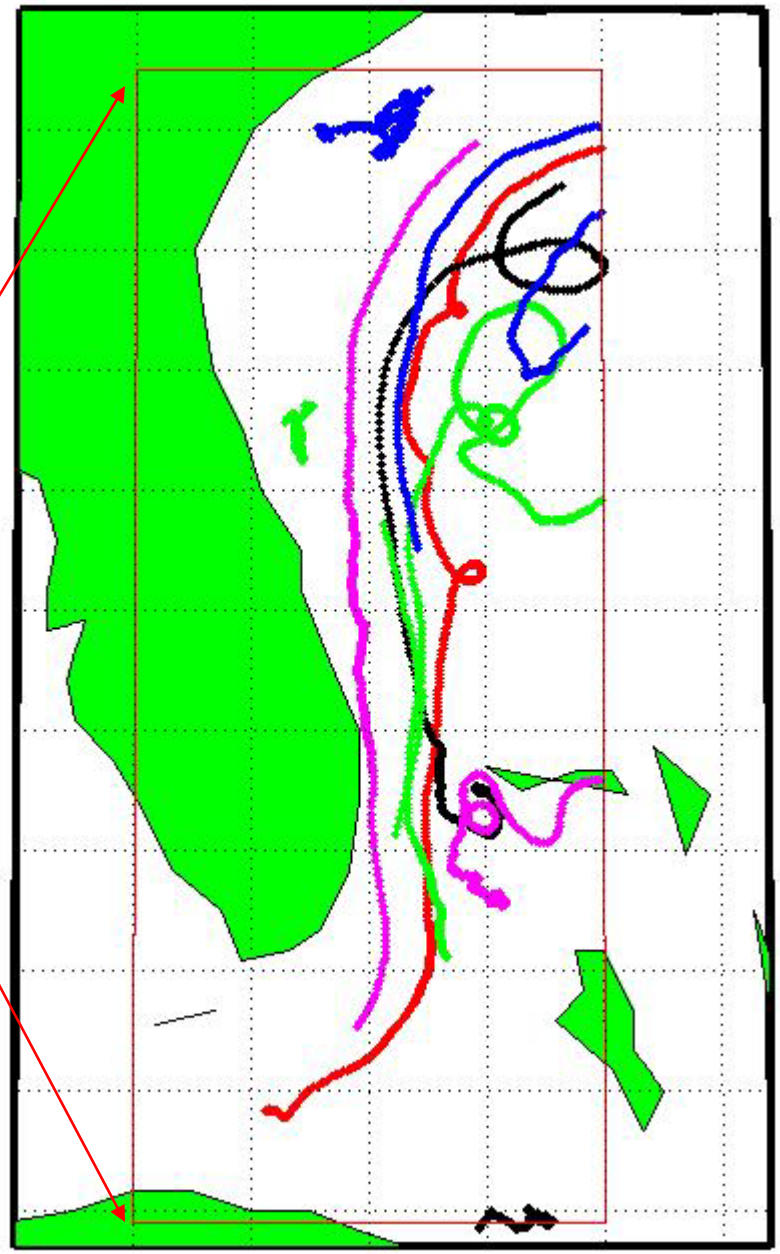
NOAA NCEP
North Atlantic HYCOM
17 SLDMBs 3,248 hrs



Florida Gulf Stream Data (FLDA) (red box)

11 SLDMBS

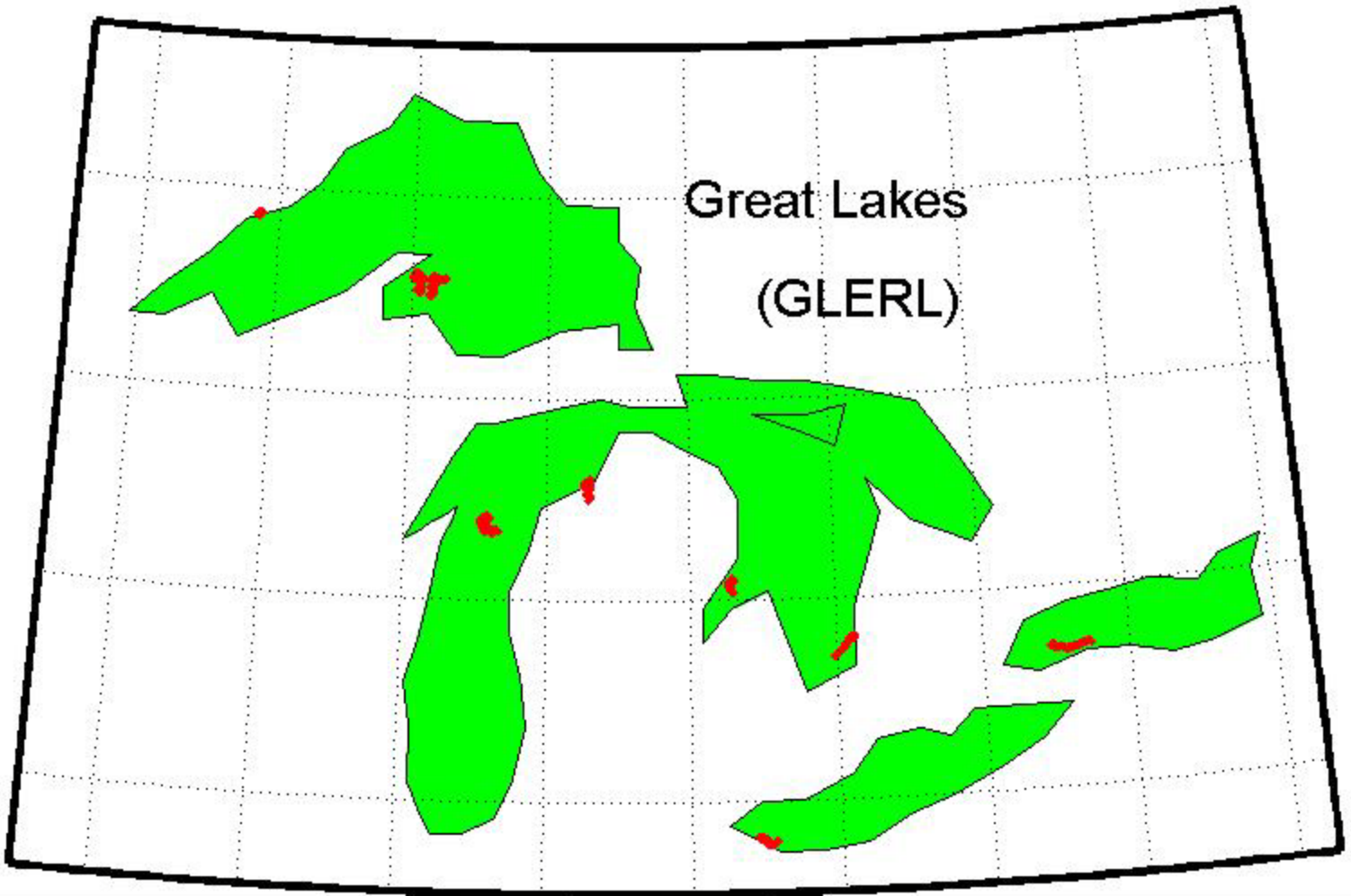
3,304 hrs



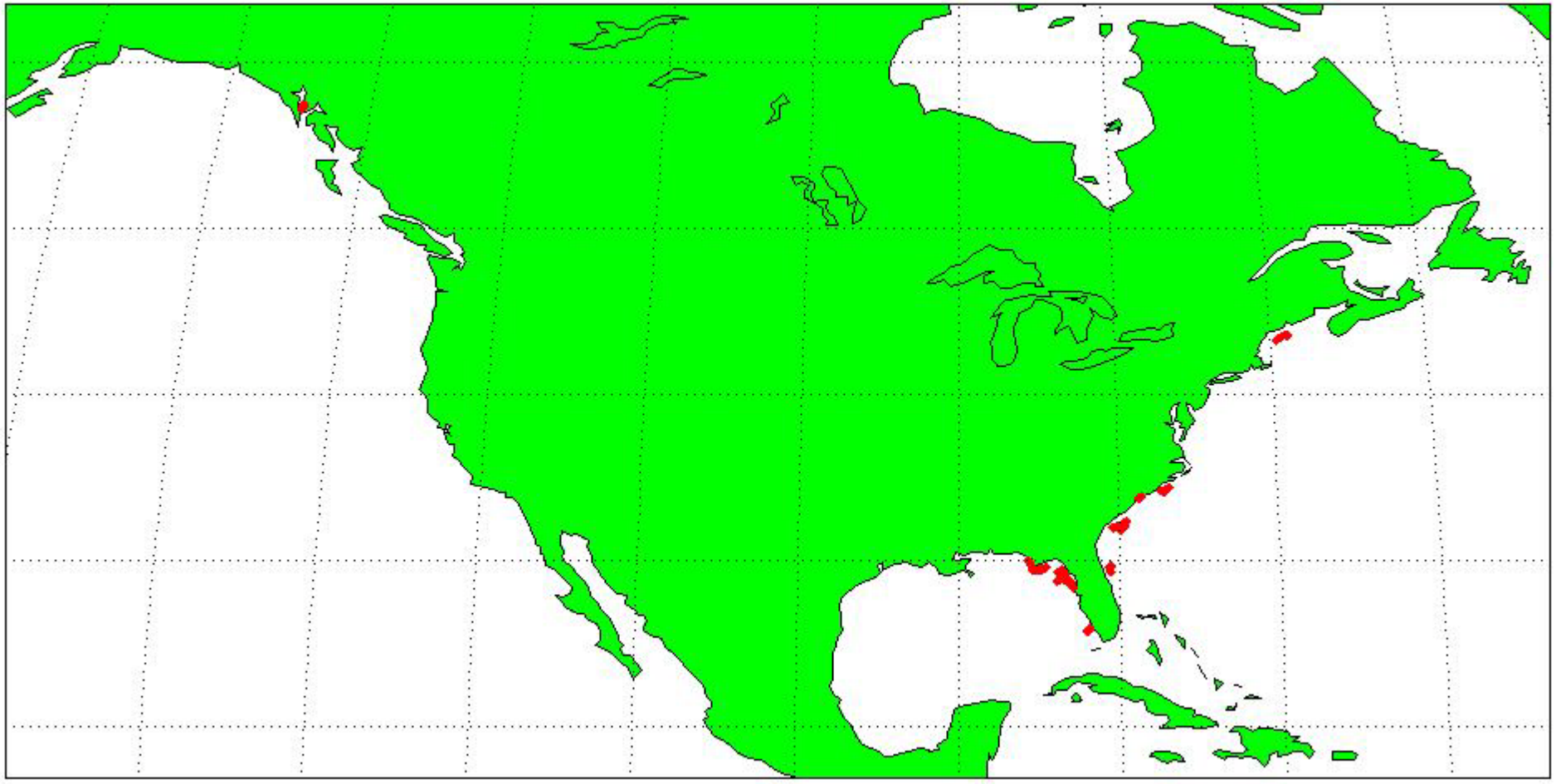
GLERL

9 SLDMBs 1,221 hrs

15 Jun – 18 Aug ‘06



ADCIRC
(Tides only)
11 SLDMBs, 3,453 hrs



EDS Uncertainties

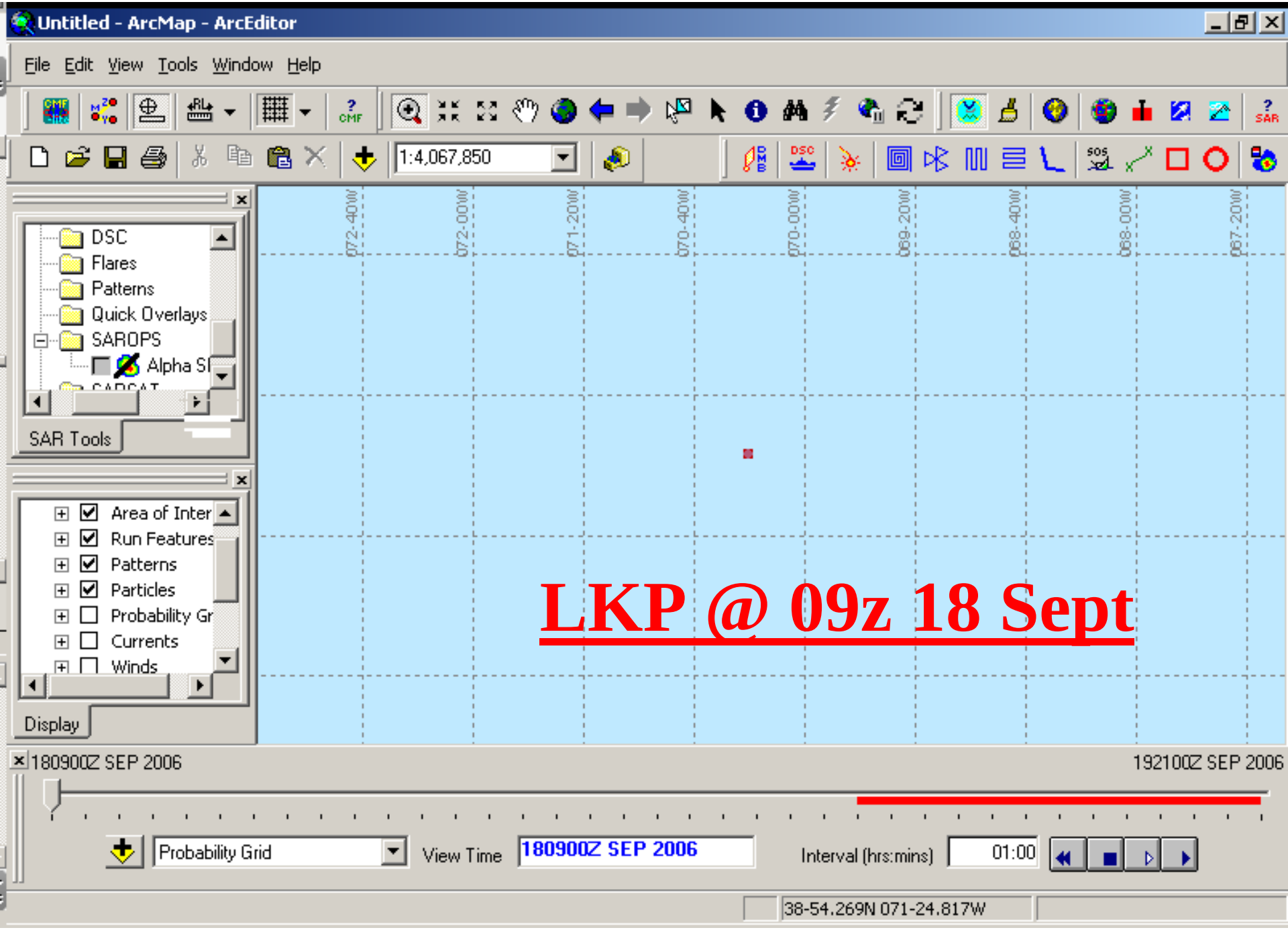
Product	# SLDMB / hrs	σ_u cm/s	Γ_u hrs	σ_v cm/s	Γ_v hrs
HR Radar Std	16 / 669	14	1.5	12	1.4
HR Radar LR	12 / 6,228	11	4.1	13	3.7
ADCIRC	11 / 3,453	14.3	2.6	13.8	5.1
ADC/NCOM	9 / 2,161	15.5	3.0	14.6	3.4
GLERL	9 / 1,221	27.8	2.3	27.6	2.3
FLDA	11 / 3,304	30.0	17.3	38.1	23.1
Mariano	82 / 28,013	25.2	21.8	27.4	23.1
HYCOM	17 / 3,248	51.3	12.3	43.0	7.2
NCOM	61 / 14,359	62.0	3.0	57.5	3.8

SAROPS Examples Uncertainties

Product (Examples)	σ (Std Dev) Kts	Γ (half-life) hrs (min)
Low / Low	0.25	3 (180)
Med / Low	0.5	3 (180)
High / Low	1.0	3 (180)
Med / High	0.5	20 (1200)
High / Med	1.0	10 (600)

“Currents Uncertainty Only Case” SAROPS inputs

1) SLDMBs
2) LKP zero error, @ 09z 18 Sept
3) Winds 0kts N, (σ 0.0 kts, Γ 60 min)
4) Currents zero **(vary σ and Γ)**
5) 24 hour drift to 09z 19 Sept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1:4,067,850
DSC
Flares
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SAR Tools
Area of Inter
Run Features
Patterns
Particles
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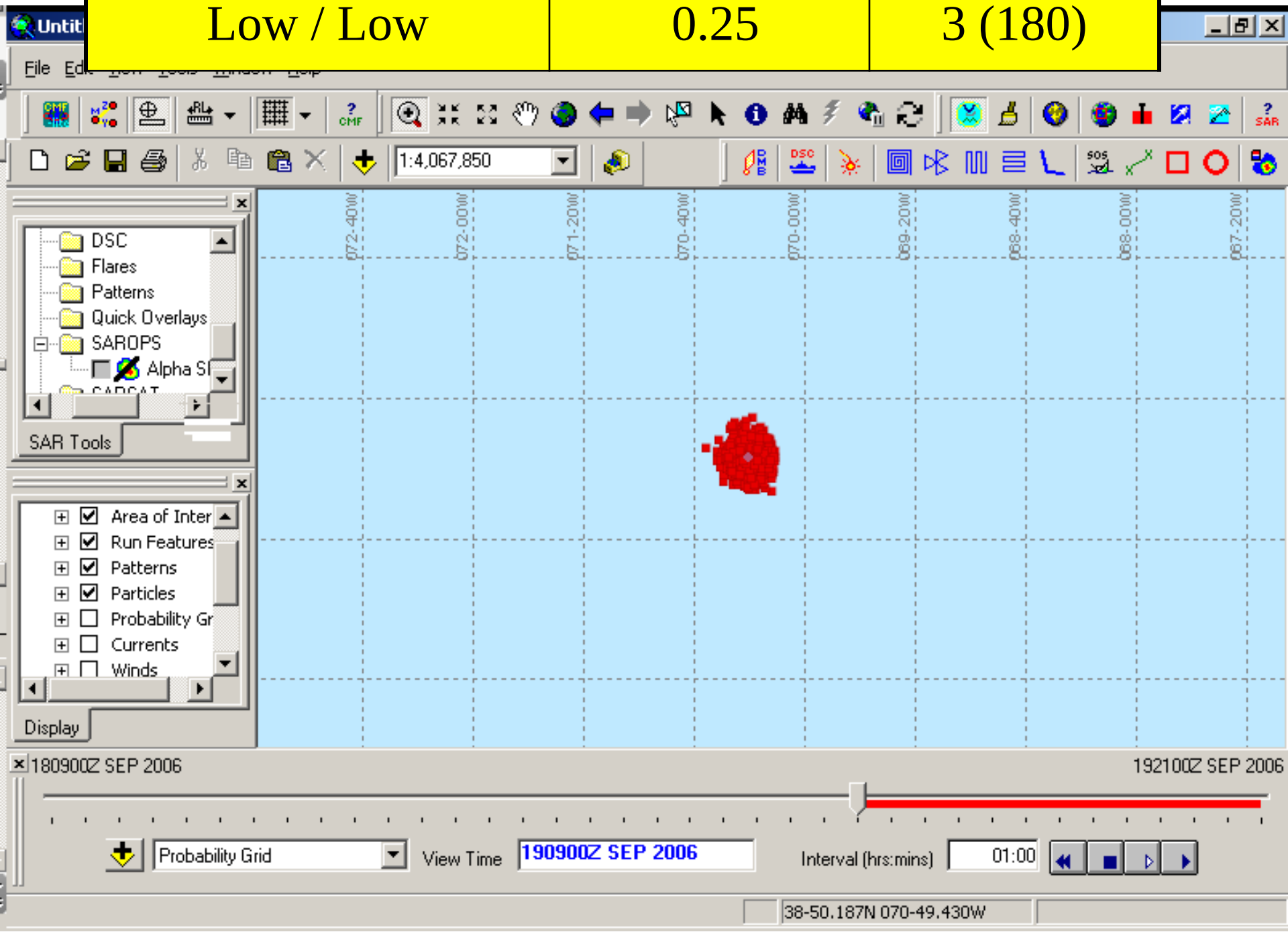
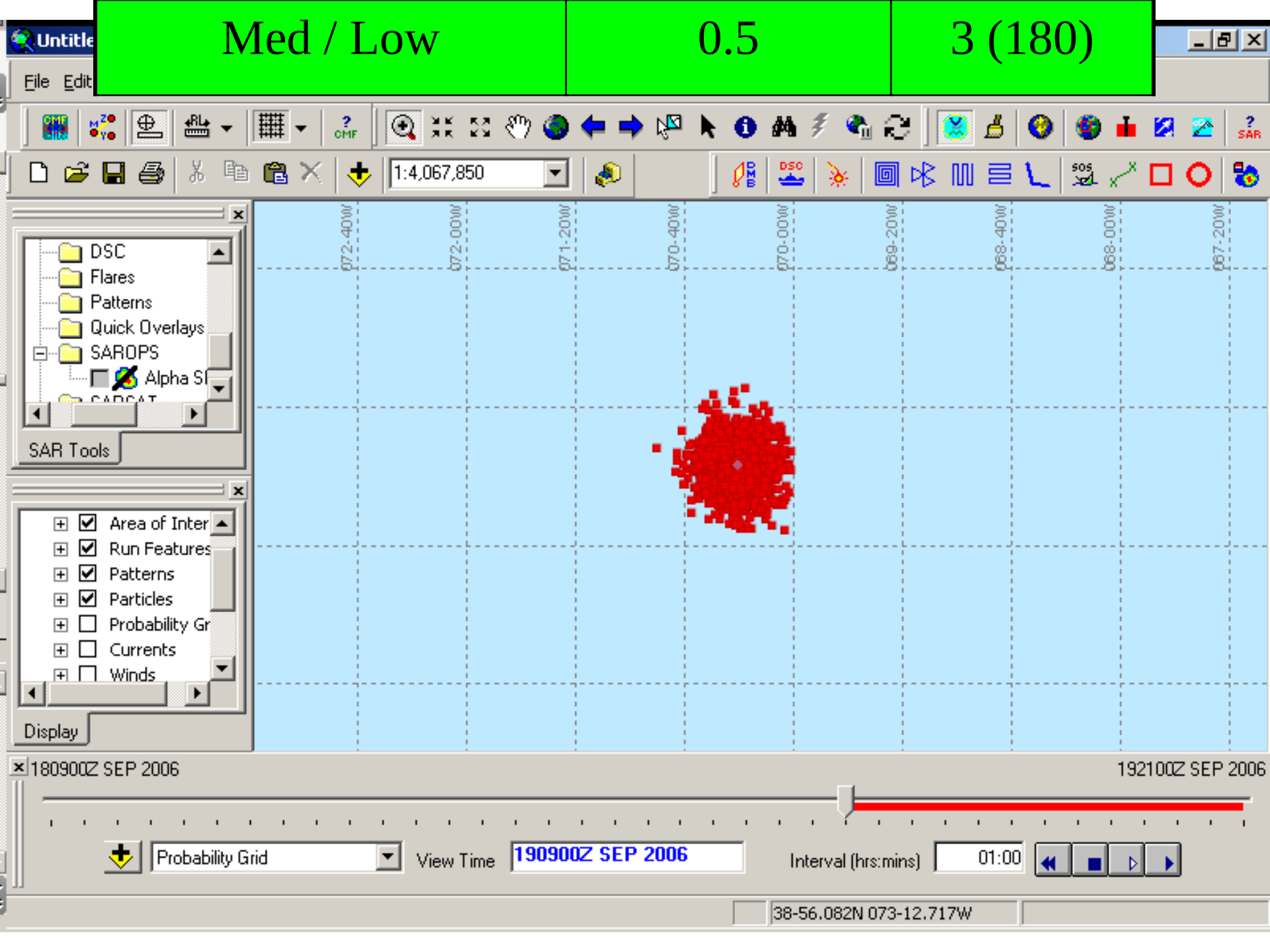
Currents
Winds
Display
072-40W
072-00W
071-20W
070-40W
070-00W
069-20W
068-40W
068-00W
067-20W
LKP @ 09z 18 Sept
180900Z SEP 2006
192100Z SEP 2006
Probability Grid
View Time
180900Z SEP 2006
Interval (hrs:mins)
01:00
38-54.269N 071-24.817W

Low / Low	0.25	3 (180)




Med / Low
0.5
3 (180)
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Area of Inter
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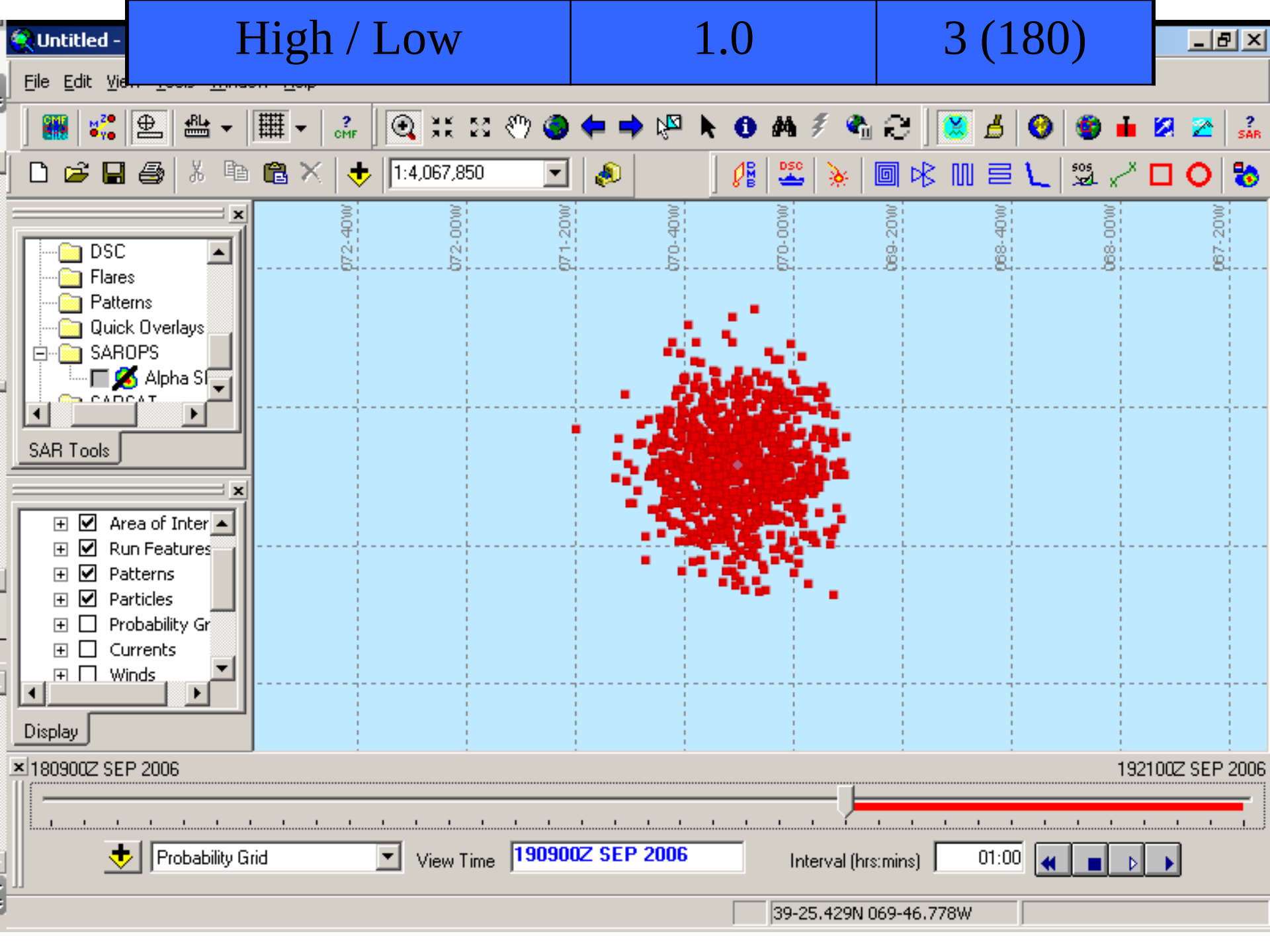
072-40W
072-00W
071-20W
070-40W
070-00W
069-20W
068-40W
068-00W
067-20W
180900Z SEP 2006
192100Z SEP 2006
Probability Grid
View Time
190900Z SEP 2006
Interval (hrs:mins)
01:00
38-56.082N 073-12.717W

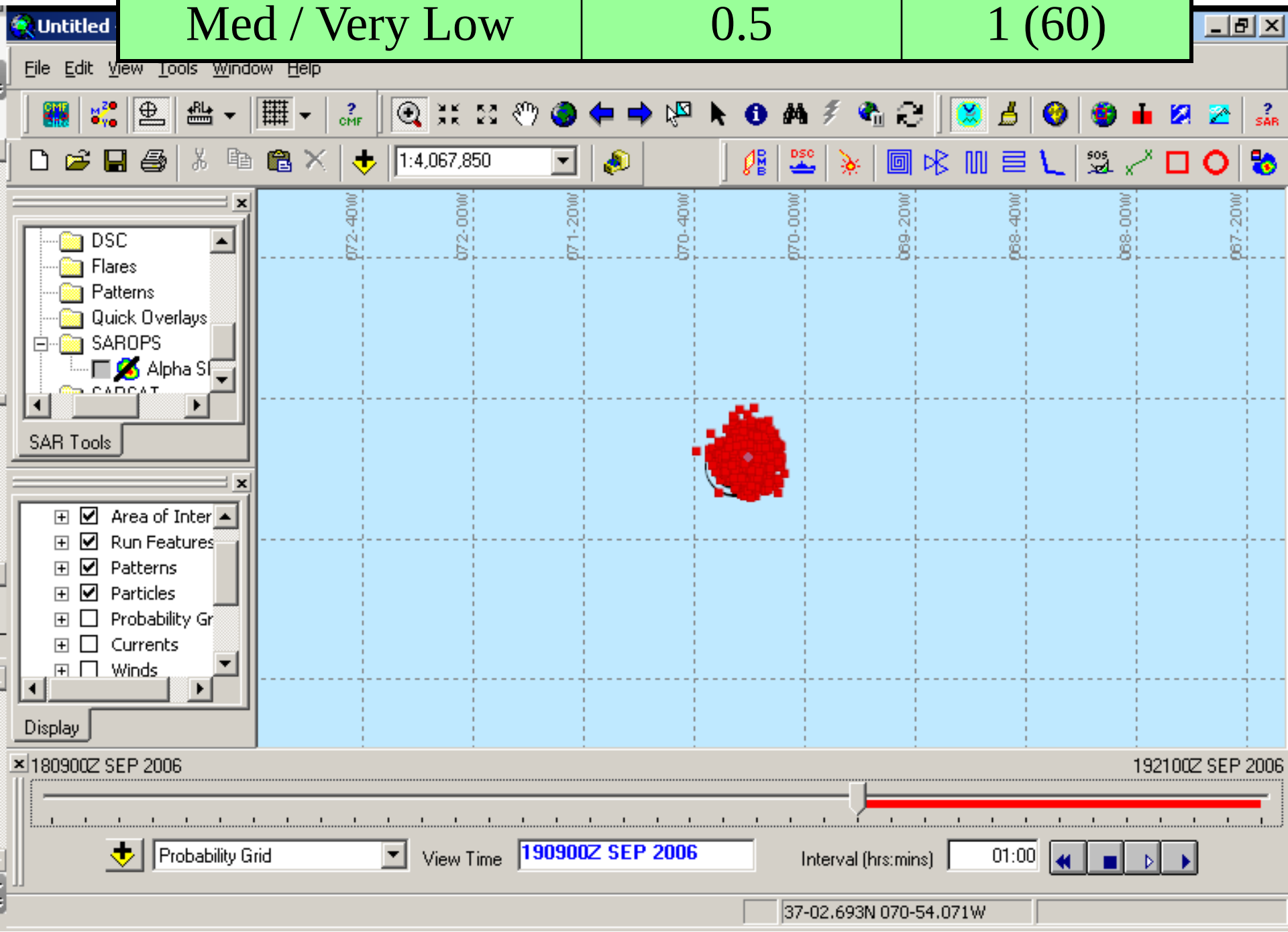
High / Low	1.0	3 (180)

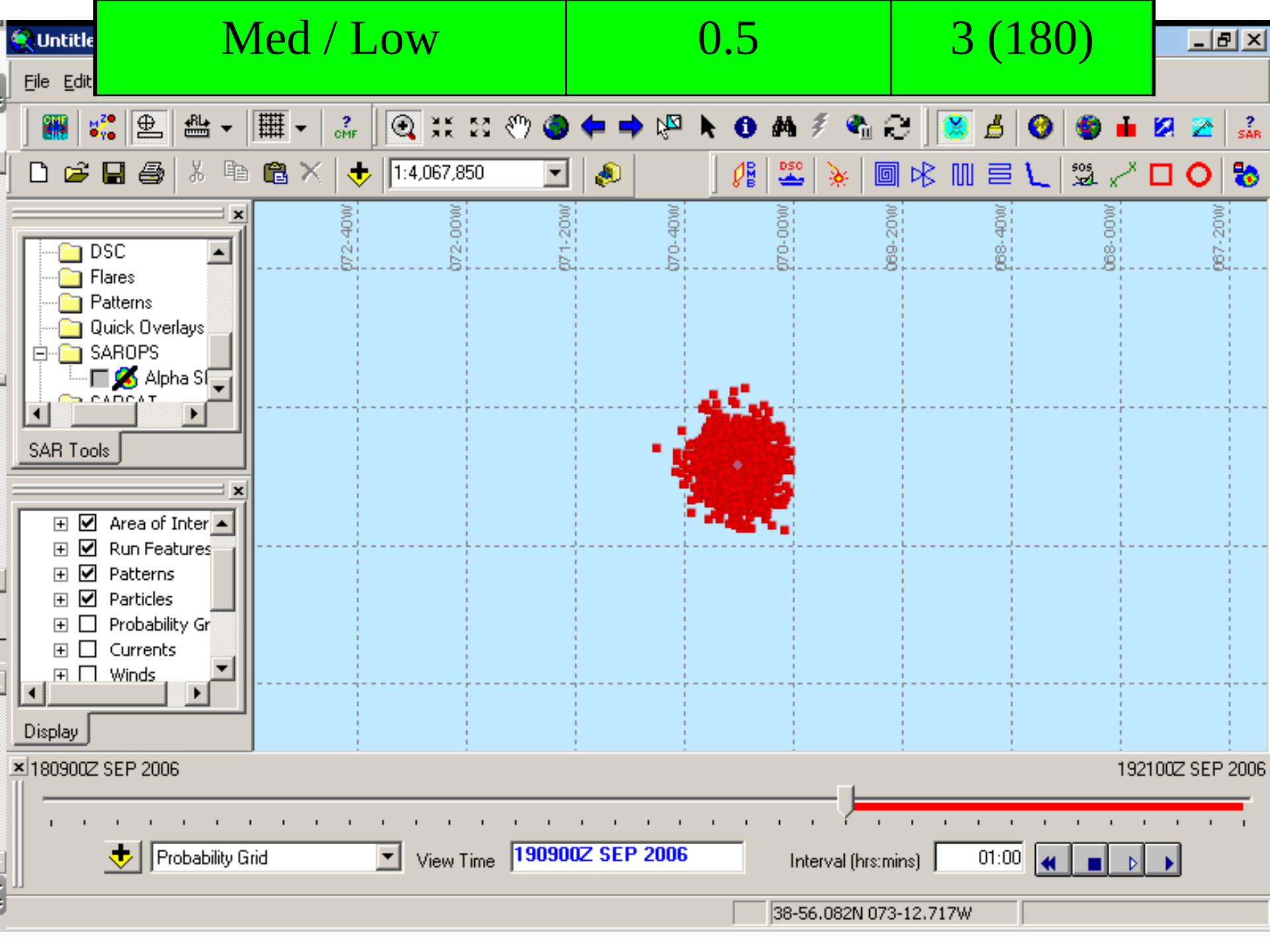


“Currents Uncertainty Only Case”
SAROPS inputs

1) SLDMBs
2) LKP zero error, @ 09z 18 Sept
3) Winds 0kts N, (σ 0.0 kts, Γ 60 min)
4) **Currents zero (σ = 0.5kts and vary Γ)**
5) 24 hour drift to 09z 19 Sept

Med / Very Low	0.5	1 (60)




Med / Low
0.5
3 (180)
File Edit
1:4,067,850
DSC
Flares
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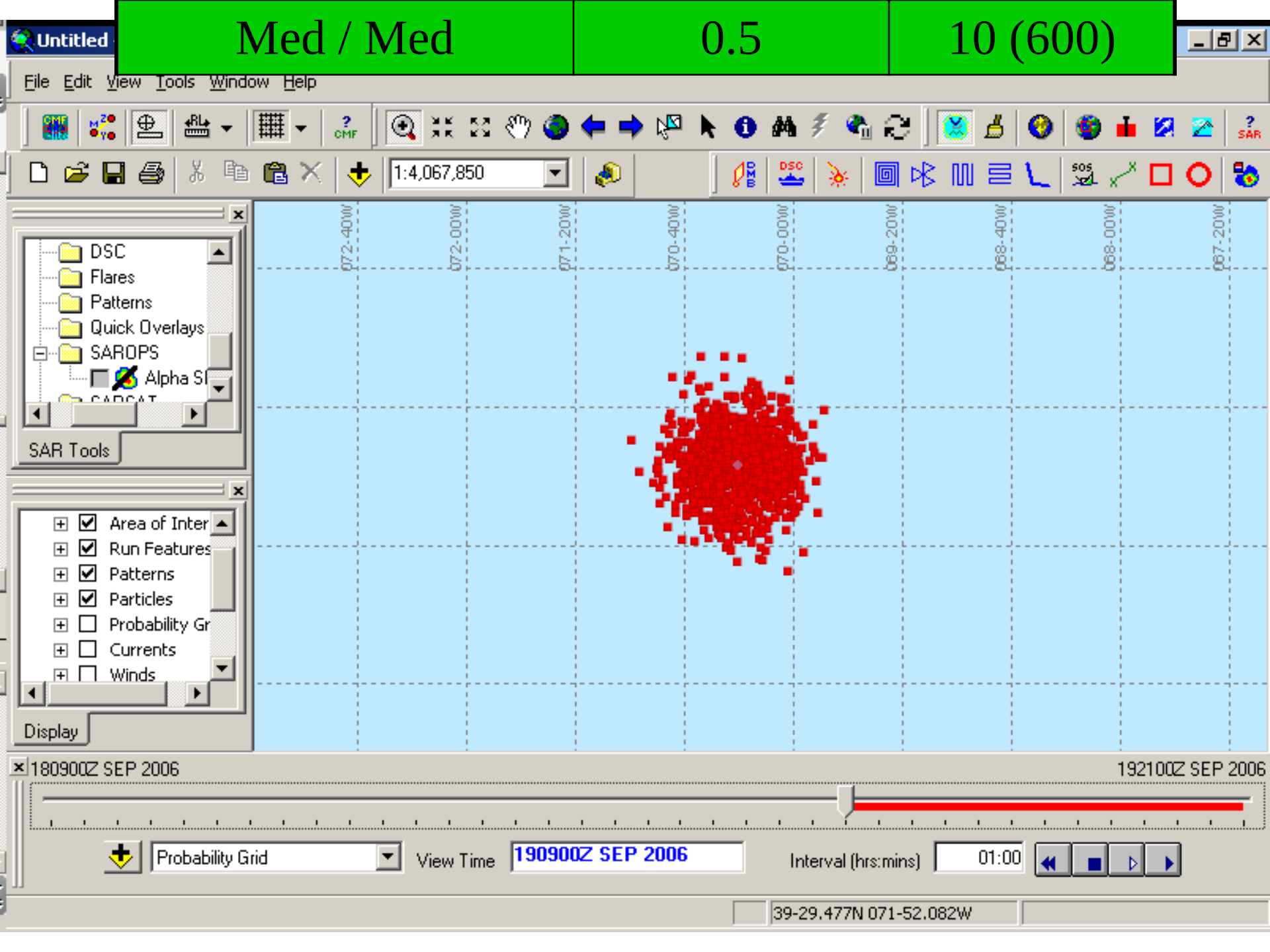
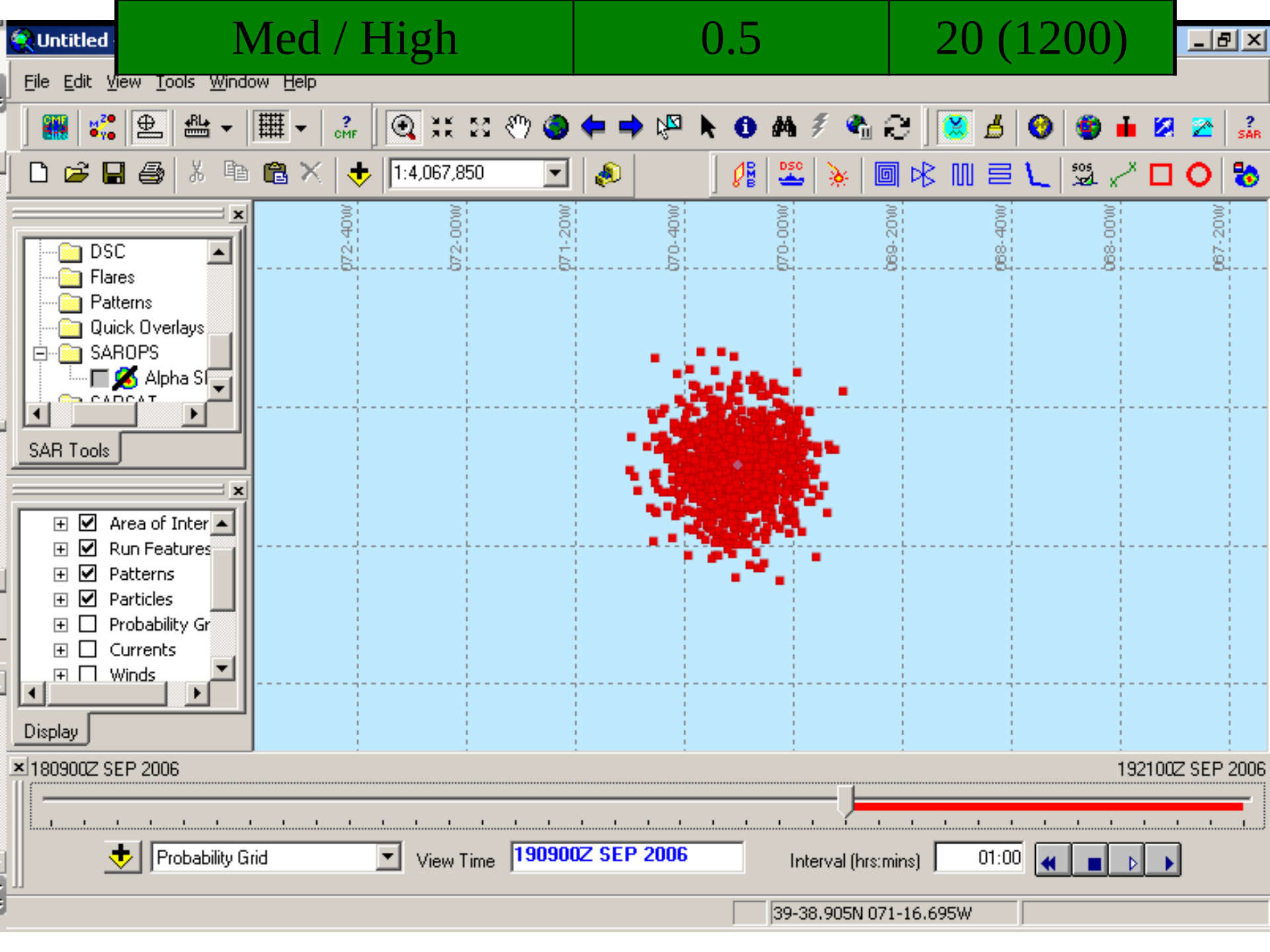
180900Z SEP 2006
192100Z SEP 2006
Probability Grid
View Time
190900Z SEP 2006
Interval (hrs:mins)
01:00
38-56.082N 073-12.717W

Med / Med	0.5	10 (600)



Med / High	0.5	20 (1200)



“Typical SAR Case”
SAROPS inputs

PIWs / Life Raft / Skiff

LKP 2 nm error, @ 00z 18 Sept (±1hr)

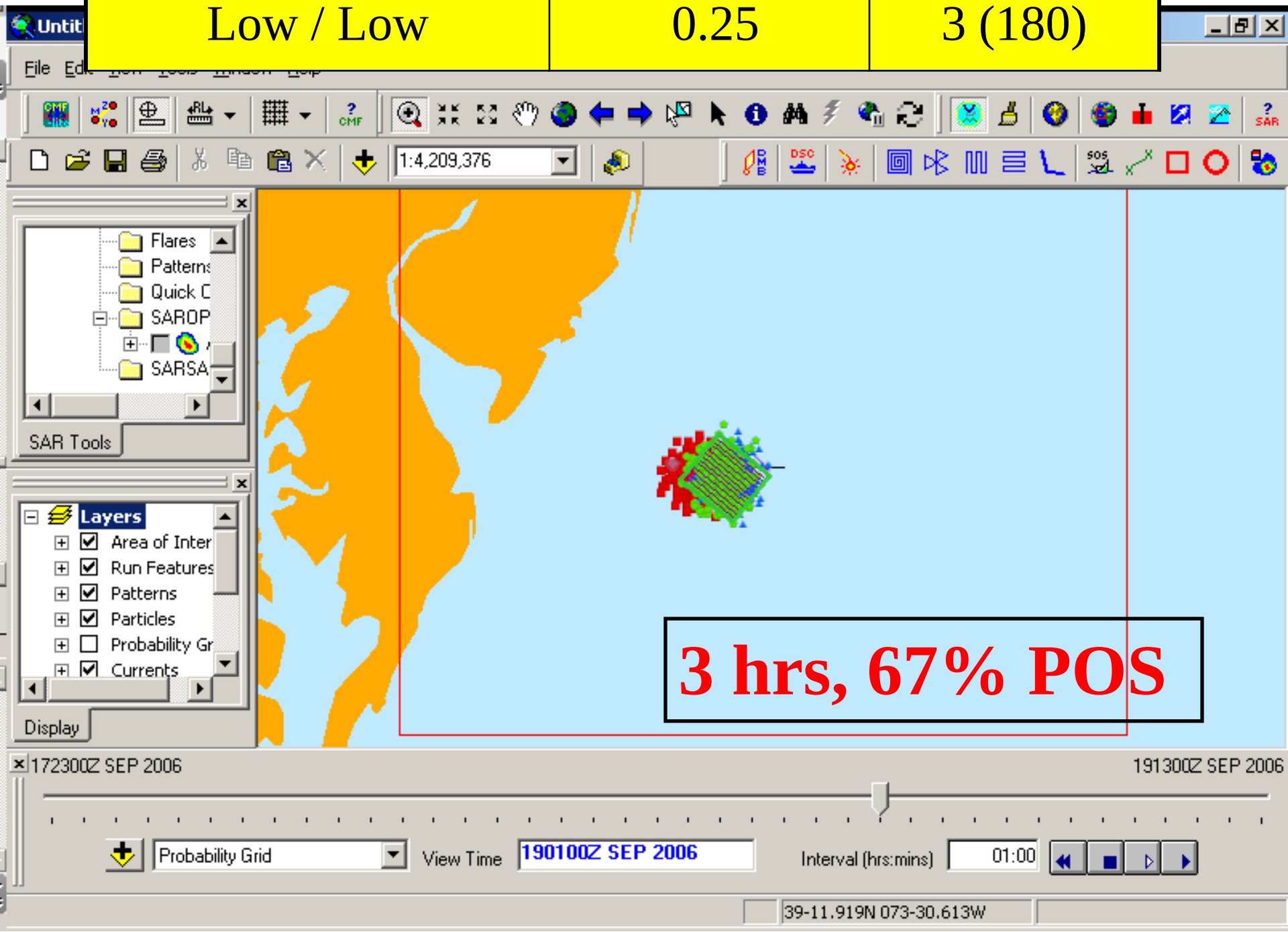
Winds 15 kts W, (σ 1.0 kts, Γ 60 min)

Currents 0.2 kts to SE **(vary σ and Γ)**

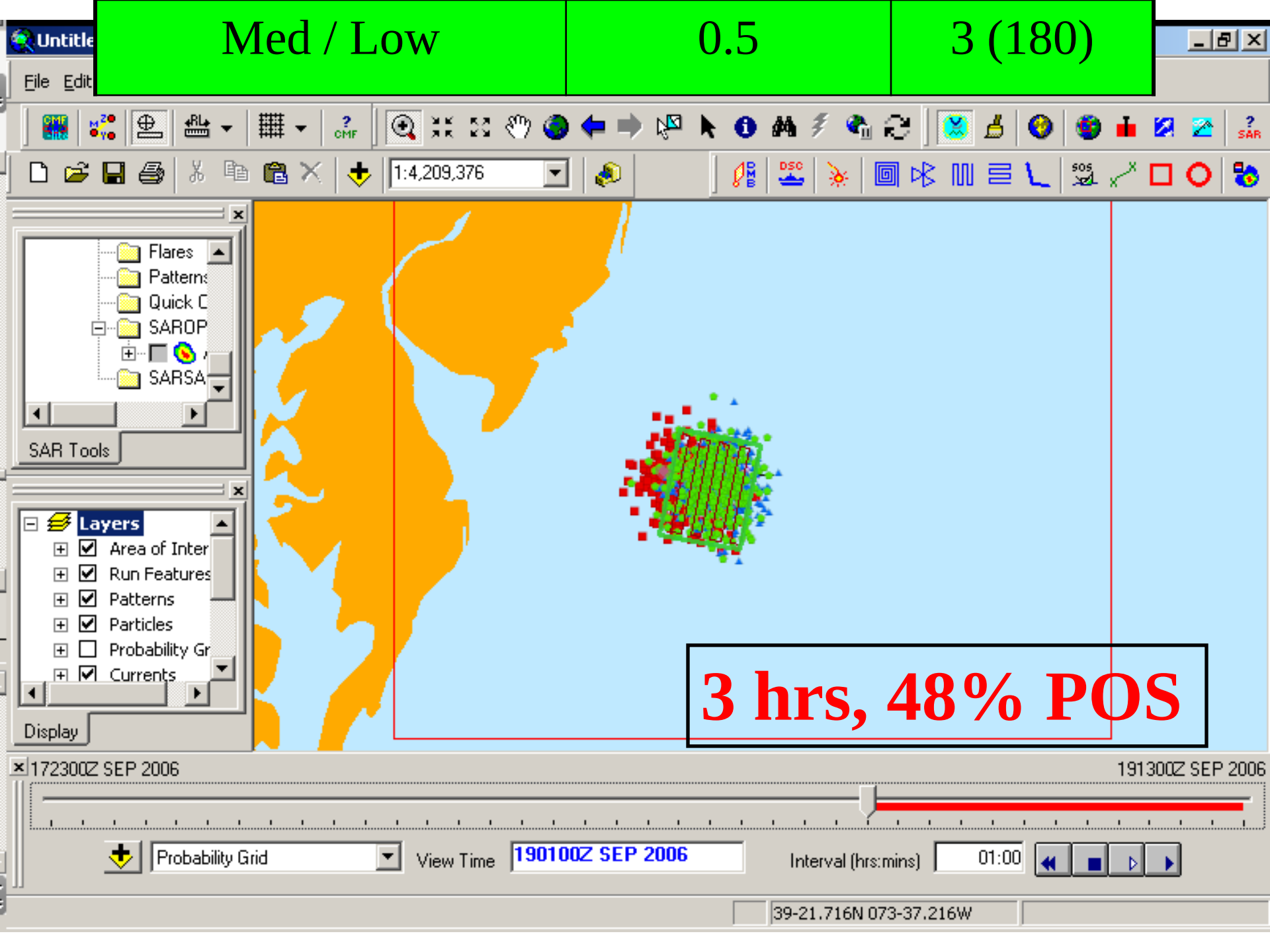
24-26 hour drift to 01z 19 Sept

1) **Helo (100 kts, 300 ft, 3 hour on-scene time, visual search)**

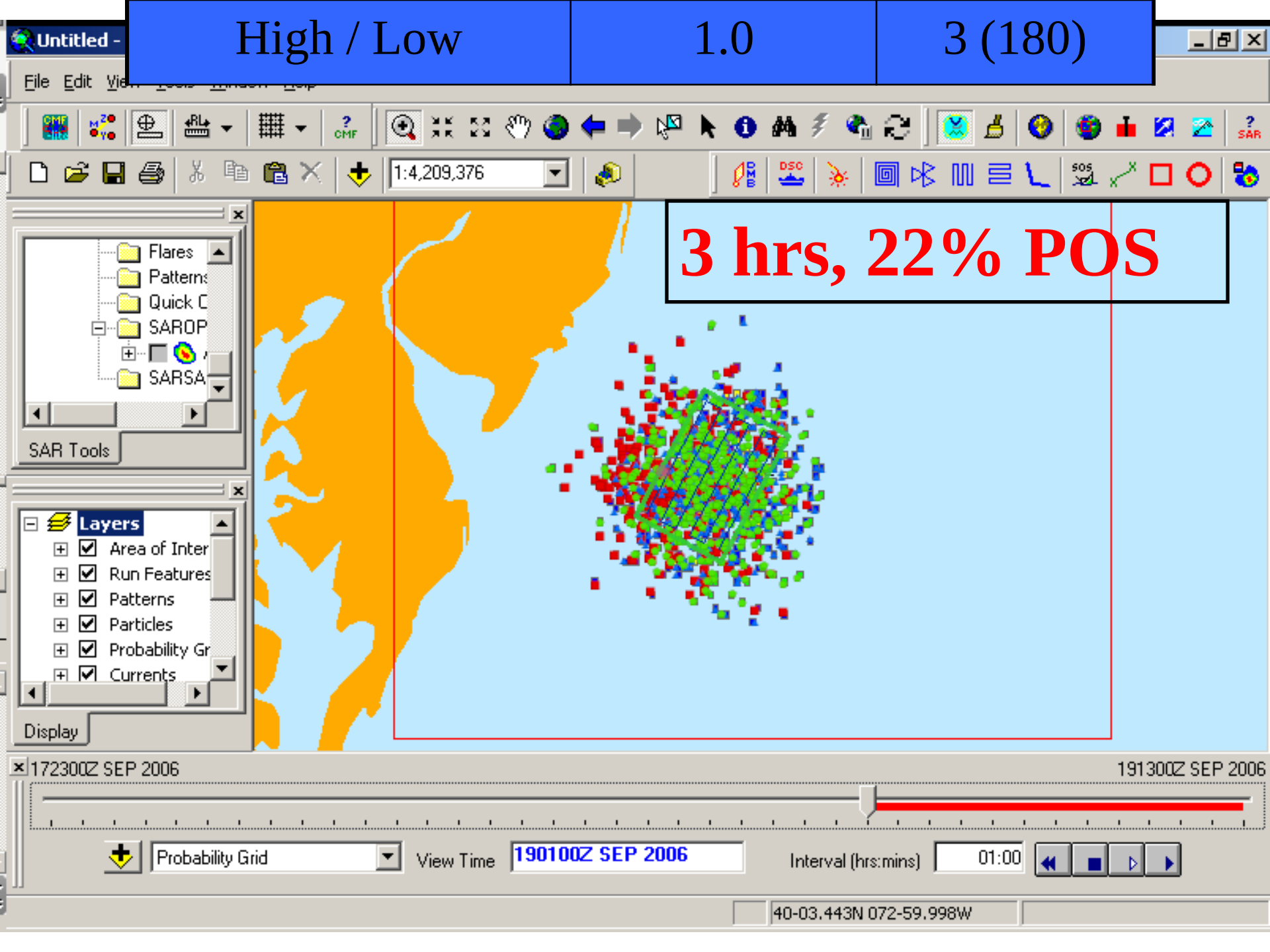
Low / Low	0.25	3 (180)



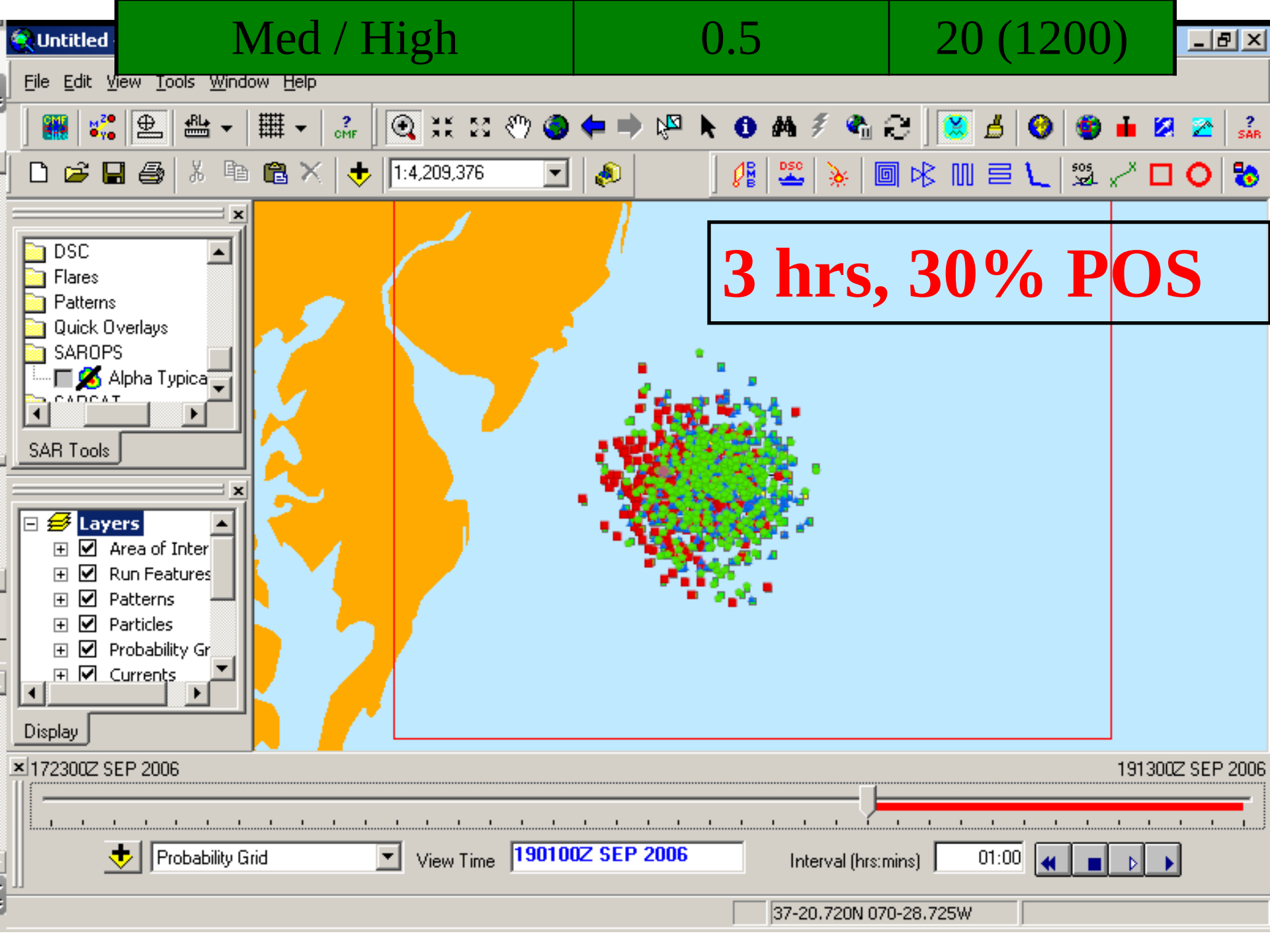
Med / Low	0.5	3 (180)



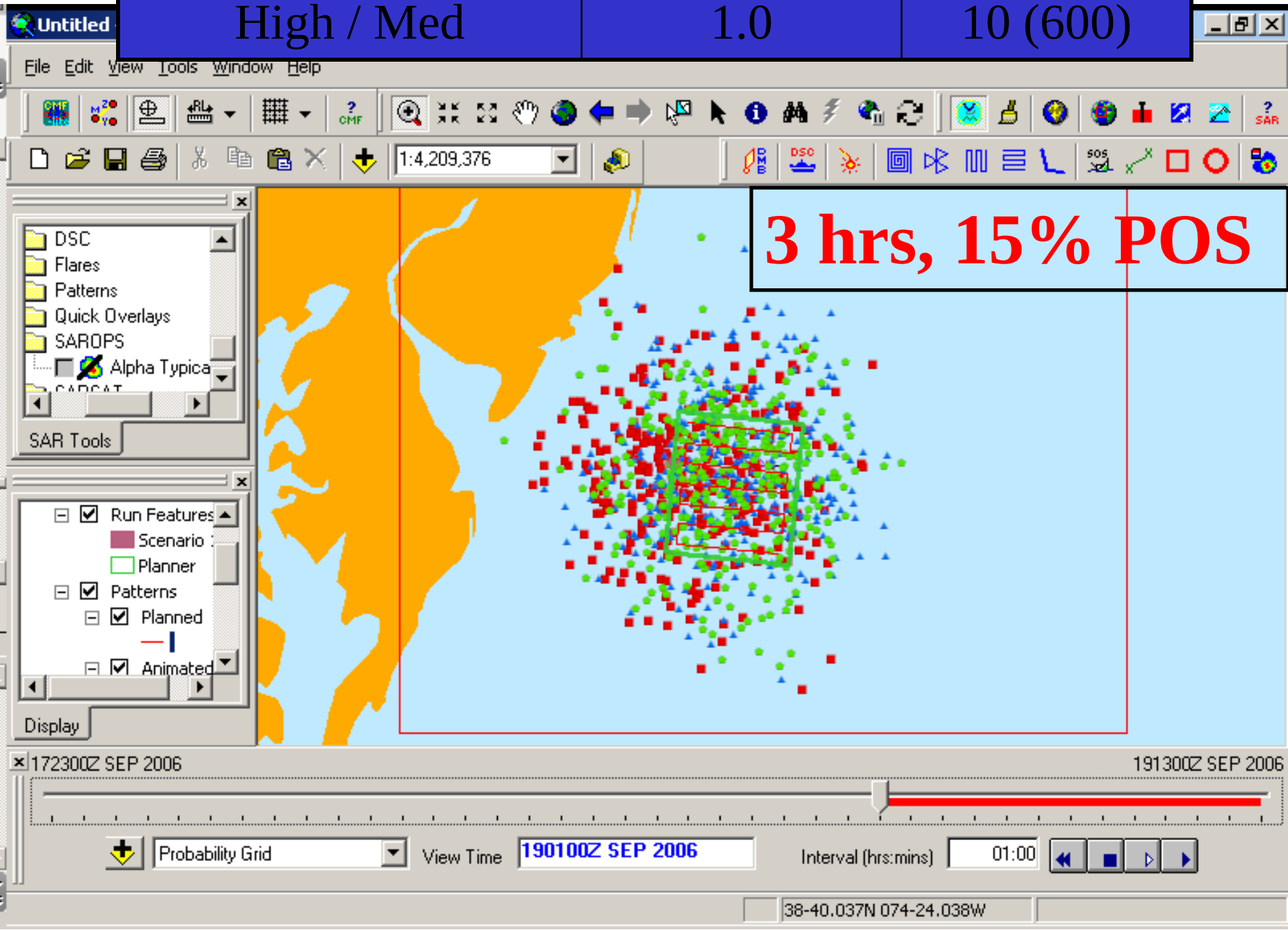
High / Low	1.0	3 (180)



Med / High	0.5	20 (1200)



High / Med	1.0	10 (600)



CG Wide

FY	Cases (K)	Lives Saved	Lives Lost		
			Before CG Notification	After	Unaccounted for
03	31.6	5,192	260	412	499
04	32.6	5,555	277	502	676
05	29.8	5,648	320	521	606
06	28.3	5,260	310	476	667

CG Wide

1) 3 searches / day = ~ 1000 / yr

2) 3 persons lost / day = ~ 1000 / yr

3) Costs $10k/hr to search

   - $10k/hr x ~1000 x ~ 3 hr = ~ $30M

4) Value of Statistical Life = $3M

   - 1000 x $3M = ~ $3B

CG Wide

1) Assume 100 persons involved / yr with sub-optimal search areas

2) Assume 22% POS now “typical”

3) 22 save/100 vs. 48/100 vs. 67/100

4) Save 26 to 45 additional persons / yr

   - ($ 78M – $135M VSL)