Oceanographic GIS:
Mapping of Ocean Processes

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Oceanographic GIS

Marine Productivity Hotspots

Mesoscale Thermal Fronts

Transient Productive Gyres

Marine Productivity Hotspots

MPH: lowSST / highChl-a anomalies

How are they computed:

1. Initial data: AVHRR SST and SeaWiFS Chl-a imagery
2. Production of climatology for SST and Chl-a
3. Production of anomaly in SST and Chl-a

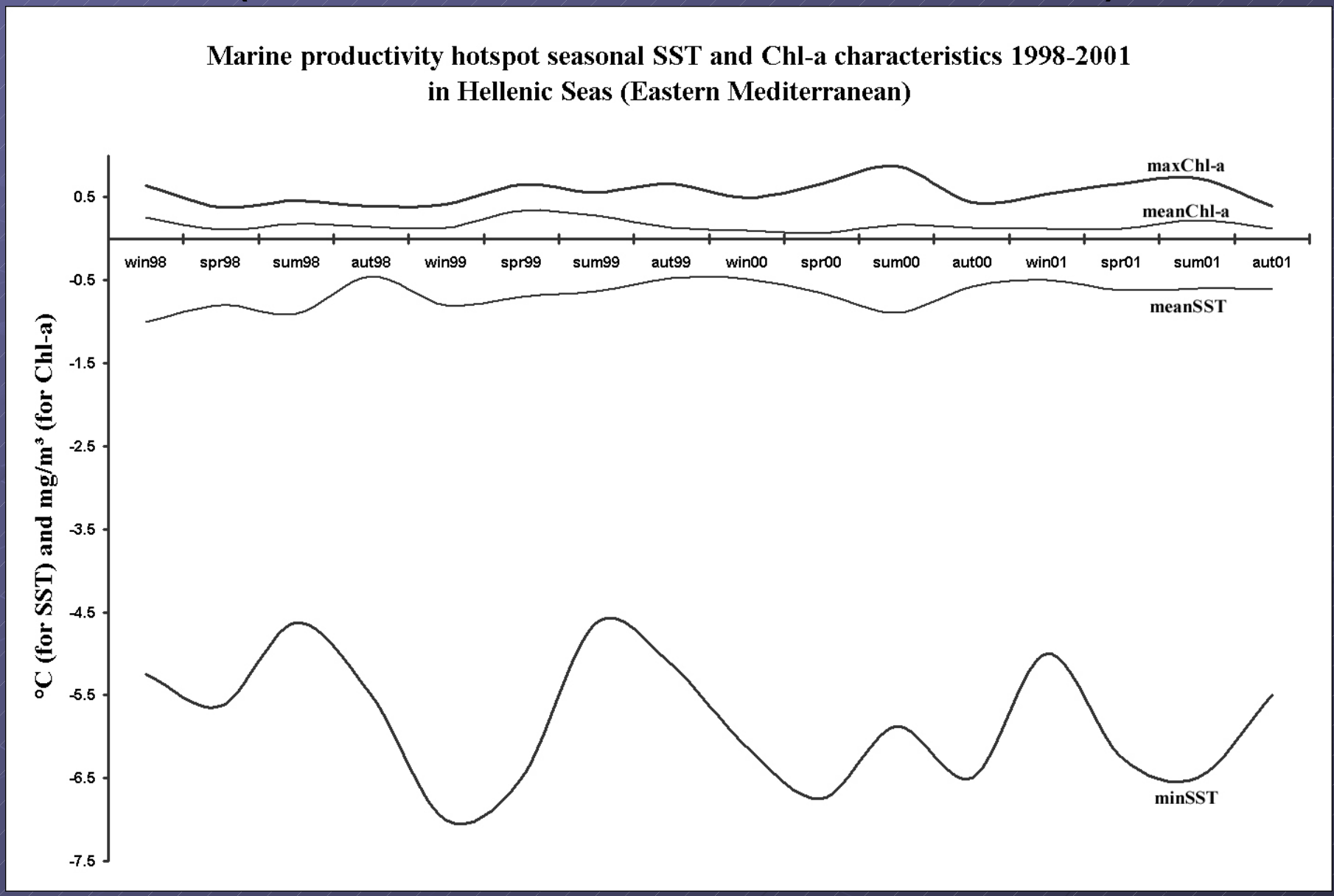
MPH: Selection of simultaneous anomaly of below-average SST and above-average Chl-a patterns

REFERENCE:

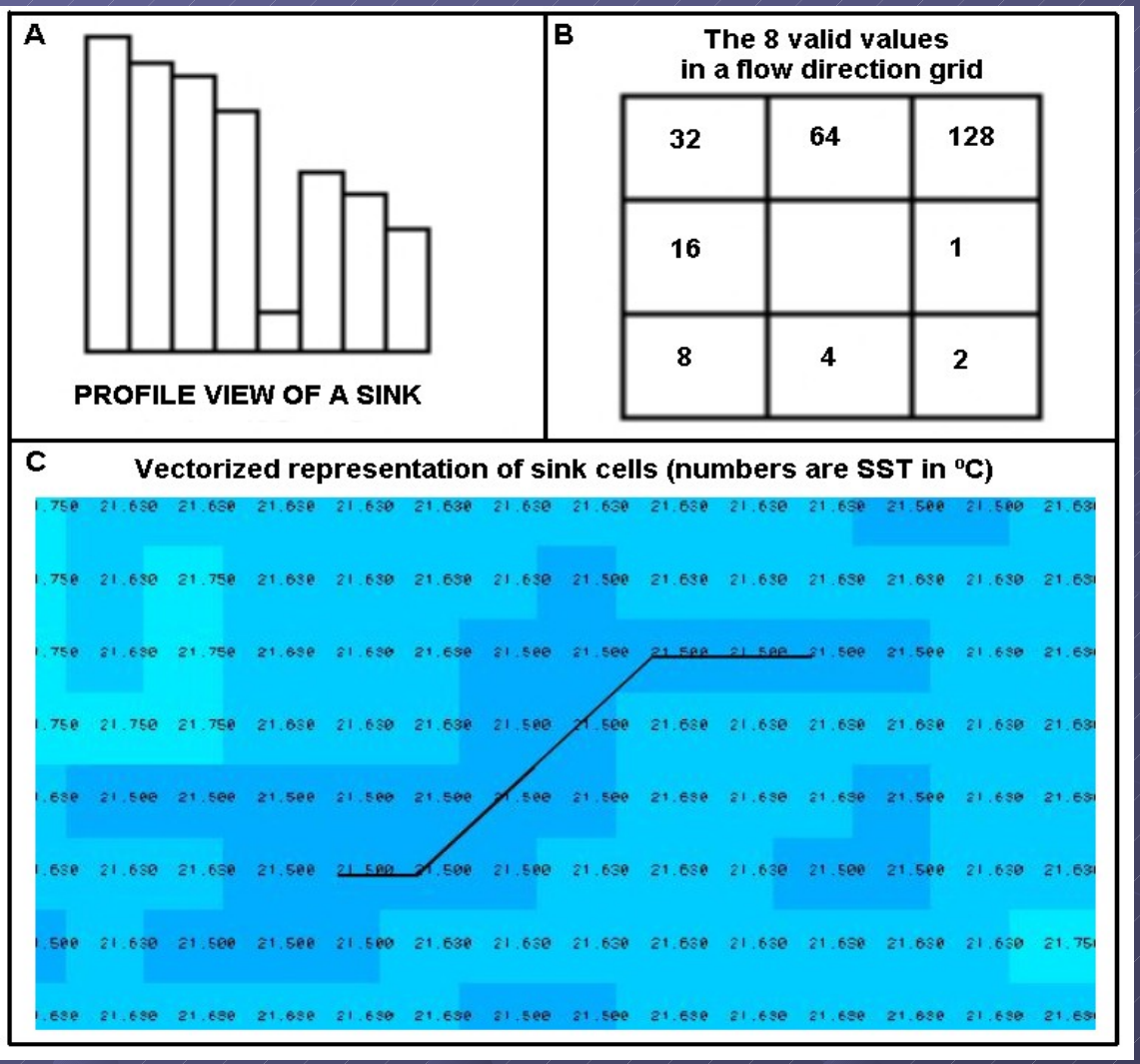
Valavanis VD, Kapantagakis A, Katara I, Palialexis A (2004). Critical regions: A GIS-based model of marine productivity hotspots. *Aquatic Sciences* **66(1)**, 139-148.

Marine Productivity Hotspots (Saharan Bank-NW Africa)

Marine Productivity Hotspots
(Calculated Environmental Characteristics)



Mesoscale Thermal Fronts



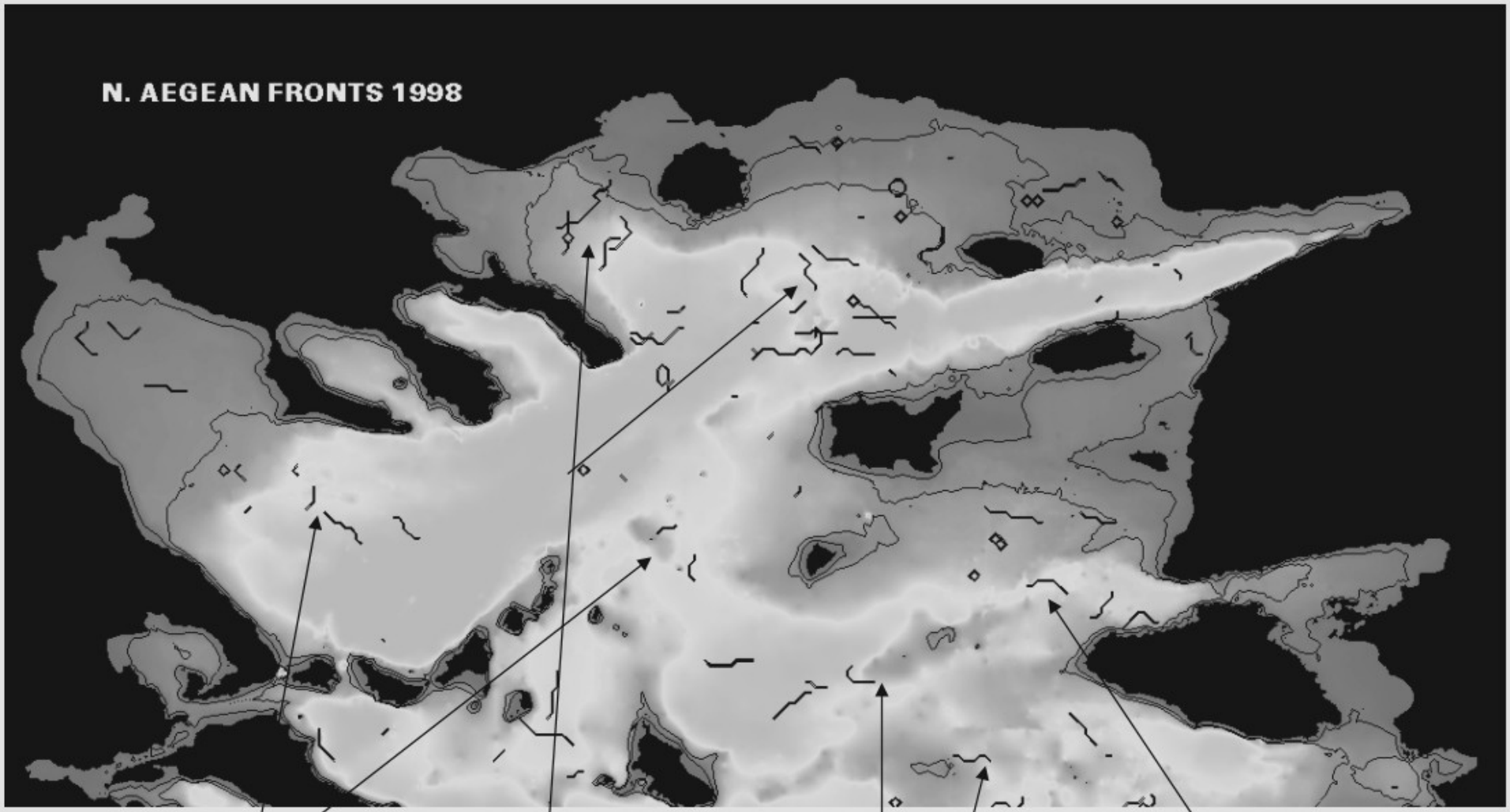
How are they computed:

Spatially connected data sinks with simultaneous DSST < 0 and DCHL > 0 patterns are mapped as mesoscale thermal fronts

REFERENCE:

Valavanis VD, Katara I, Palialexis A (2005). Identification of mesoscale thermal fronts using satellite imagery and GIS. *International Journal of Geographical Information Science* **19(8):**in press

Mesoscale Thermal Fronts
(North Aegean Sea-Eastern Mediterranean)



Mesoscale Thermal Fronts (Calculated Environmental Characteristics)

Table 1. Monthly and seasonal mean environmental characteristics of shelf, shelf break and open water mesoscale thermal fronts in the Hellenic Seas (Eastern Mediterranean Sea) during 1998-2003.

	SHELF FRONTS (coast to -350m)				SHELF BREAK FRONTS (-350m to -650m)				OPEN WATER FRONTS (deeper than -650m)			
PERIOD 98-03 MONTH	MEAN DSST (°C)	MEAN DCHL (mg/m³)	MEAN DEPTH (m)	NUMBER OF FRONTS	MEAN DSST (°C)	MEAN DCHL (mg/m³)	MEAN DEPTH (m)	NUMBER OF FRONTS	MEAN DSST (°C)	MEAN DCHL (mg/m³)	MEAN DEPTH (m)	NUMBER OF FRONTS
JAN	-1.10	0.6199	-177	10	-0.94	0.1439	-508	8	-0.75	0.0943	-2520	58
FEB	-0.93	0.3163	-201	11	-0.66	0.3848	-510	8	-0.66	0.0900	-2524	57
MAR	-0.73	0.2709	-207	9	-0.52	0.1432	-467	4	-0.53	0.0710	-2502	56
APR	-0.97	0.7103	-182	10	-0.78	0.1092	-477	7	-0.53	0.0718	-2492	56
MAY	-1.63	0.1675	-167	9	-0.88	0.1551	-498	7	-0.57	0.0552	-2423	50
JUN	-0.80	0.1928	-190	5	-0.75	0.0915	-456	3	-0.37	0.0485	-2554	28
JUL	-0.35	0.1135	-150	2	-0.48	0.1726	-477	2	-0.26	0.0543	-2788	17
AUG	-0.36	0.1472	-138	3	-0.49	0.1782	-493	2	-0.29	0.0456	-2712	20
SEP	-0.46	0.3292	-185	3	-0.43	0.1232	-514	4	-0.43	0.0588	-2577	35
OCT	-0.80	0.1604	-177	6	-0.52	0.0942	-518	7	-0.61	0.0643	-2415	48
NOV	-0.92	0.2243	-178	13	-0.79	0.2178	-488	10	-0.80	0.0735	-2593	55
DEC	-0.96	0.2709	-199	15	-0.95	0.1670	-491	11	-1.09	0.1131	-2452	80
ALL MONTH	-0.83	0.2936	-179	8	-0.68	0.1651	-491	6	-0.57	0.0700	-2546	47
WIN	-0.92	0.4023	-195	10	-0.71	0.2240	-495	7	-0.65	0.0851	-2515	57
SPR	-1.13	0.3569	-180	8	-0.80	0.1186	-477	5	-0.49	0.0585	-2490	45
SUM	-0.39	0.1966	-158	3	-0.46	0.1547	-497	3	-0.33	0.0529	-2692	24
FAL	-0.89	0.2185	-185	11	-0.75	0.1597	-499	10	-0.83	0.0836	-2487	61

Transient Productive Gyres

How are they computed:

1. Initial data:
- **Merged T/P, ERS1/2, Jason1, Envisat Sea Level Anomaly (SLA) Images**
- **AVHRR SST and SeaWiFS Chl-a imagery**

2. Optimum Interpolation of SLA imagery (combined kriging+IDW)

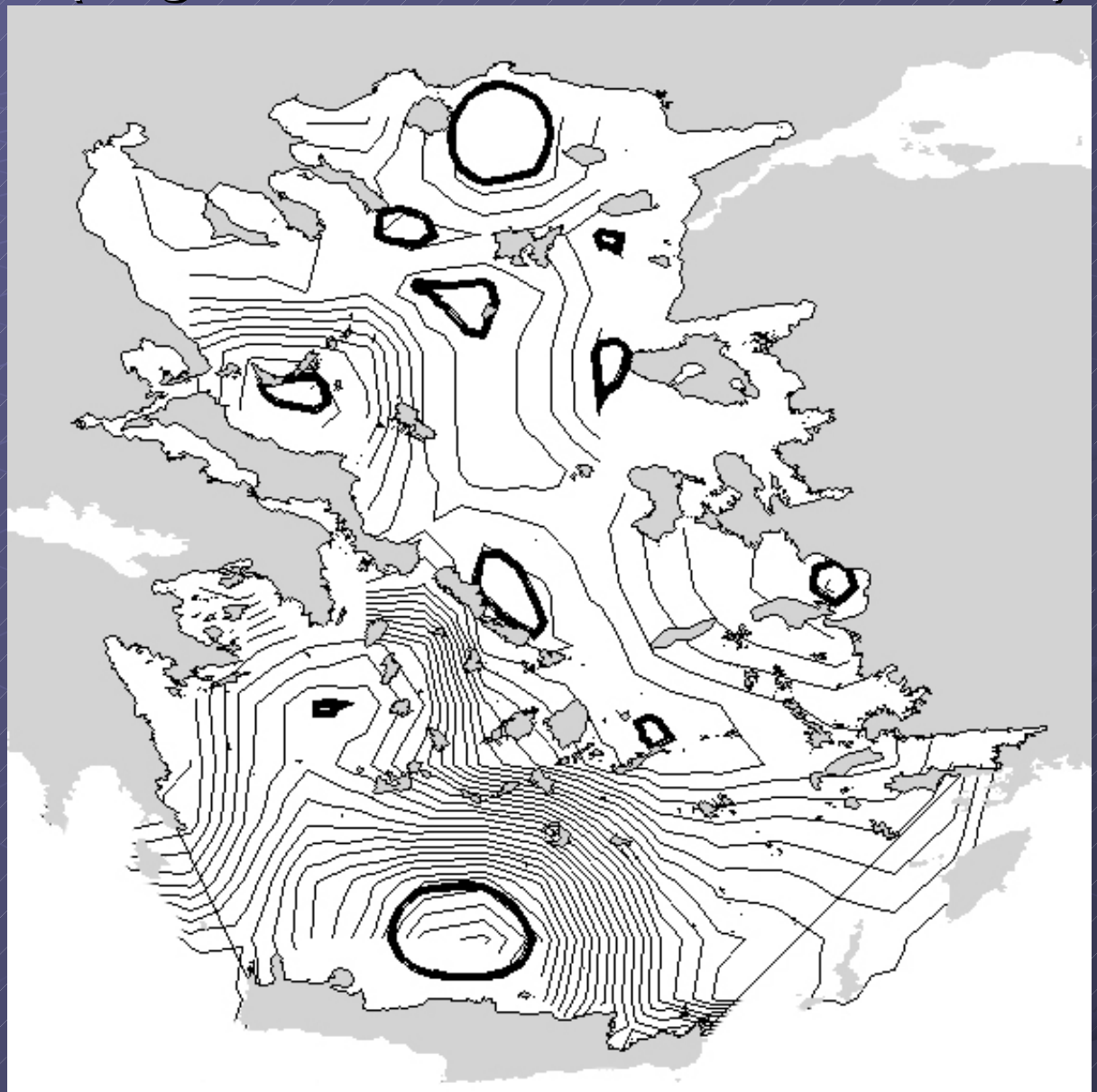
3. Contouring of interpolated SLA data and Selection of closed lines

4. Measurement of Productivity Levels from DChl-a > 0 and DSST < 0

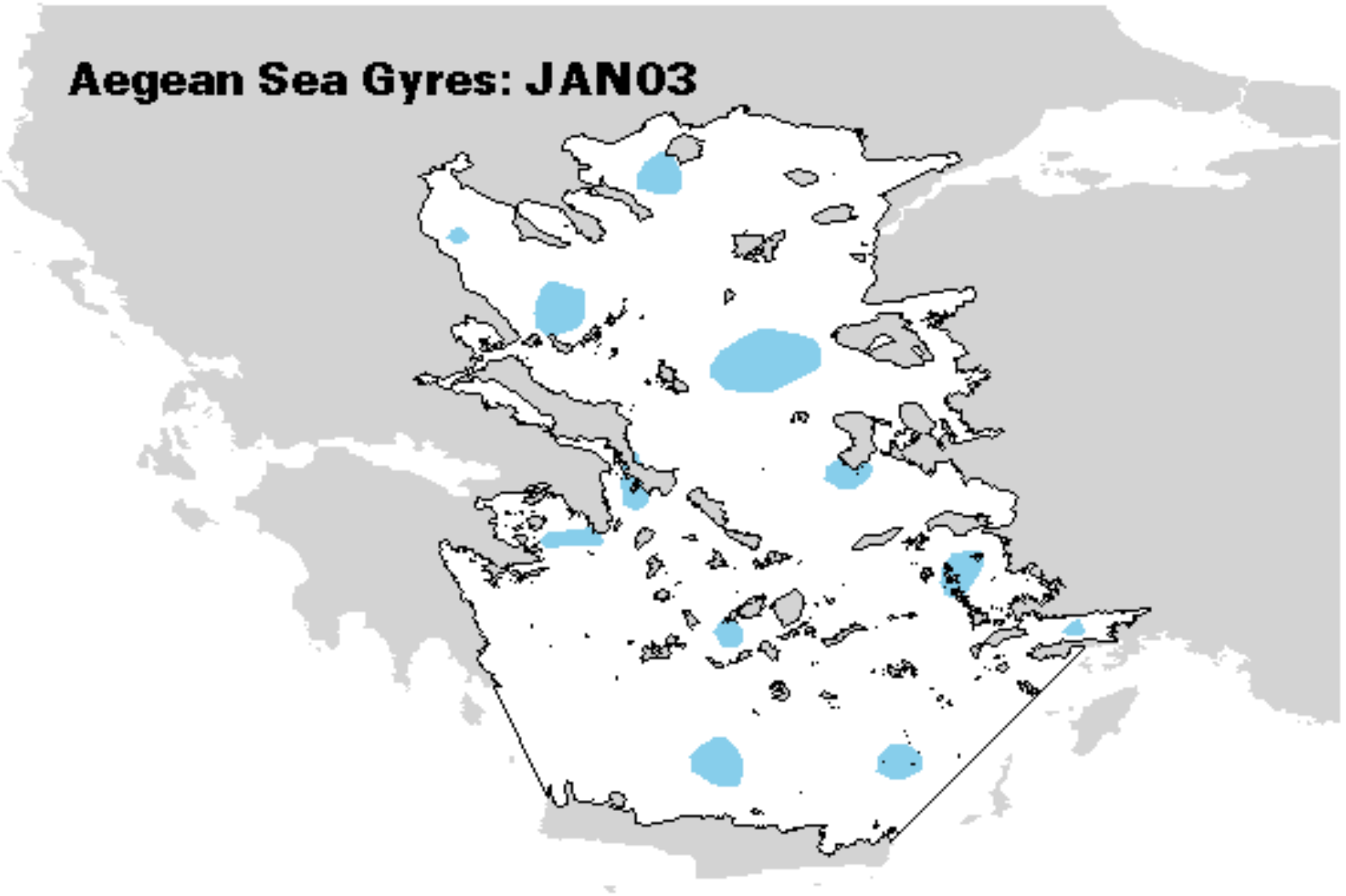
REFERENCE:

Valavanis *et al*. Identification of transient productive gyres in semi-enclosed seas (in preparation).

Transient Productive Gyres
(Aegean Sea-Eastern Mediterranean)



Transient Productive Gyres
(2003-2004 Aegean Sea-Eastern Mediterranean)



Data Sources & Software

- AVHRR SST: DLR-Germany (eoweb.dlr.de:8080)
- SeaWiFS Chl-a: NASA-USA (oceancolor.gsfc.nasa.gov)
- Altimetry: CNES-France (www.jason.oceanobs.com)

- ESRI ArcGIS ARCINFO (ARC, GRID, TABLES, ARCPLOT)
- Programming: Arc Macro Language (AML)