I.36.

SNOW ANALYSIS IN ARPEGE/CANARI

Final report based on the work done in METEO-FRANCE during the time

25 June - 14 July 2001

by

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METEO-FRANCE/CNRM/GMAP, TOULOUSE

SNOW ANALYSIS IN ARPEGE / CANARI

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INTRODUCTION

The work on the snow analysis began in February 2000 with reinitialization and update of the Meteo-France OI objective analysis scheme CANARI. The validation was done mainly within the frame of a single-obs experiment with ALADIN-FRANCE (CY22T1/AL12 libraries). The results are presented in Gaytandjieva et al (2000a).
During September -November 2000 the work went on with studying the observation operator and the statistical model for the snow analysis. The experiments were performed with full set of observations with ALADIN-BG (CY22T2/AL13 libraries). The correlation function was modified and vertical component was added. The validation of the results of the snow analysis was done by studying the distribution of the increments (analyses -guess) and by comparing the analysis field with the reported values at the observation points. It was shown that with the modified correlation function there was an improvement of the analysis field and good agreement with the observations. The results are presented in Gaytandjieva et al (2000b).
The purpose of the third part of the work (June - July 2001) is to study the results of the global IFS/ARPEGE/CANARI snow analysis (CY24T1 libraries).

SECTION I. Statistical model and snow observation operator in the frame of the CANARI OI scheme

The statistical model used in the ALADIN/CANARI snow analysis (Gaytandjieva et al (2000b)), is :

- the analysed variable is the **snow quantity [kg.m^{-2}]**;
- the variable is locally continuous, the correlation function of the variable is locally homogeneous and isotropic and the statistical structure for the other surface elements analysed in CANARI, is applied for the snow analysis as well;
- the correlation function is of the type $\mu(r, p) = \mu_h(r) * \mu_v(p)$, where
  $\mu_h(r) = \exp(-1/2*(r/d)^2)$, **r** is the horizontal distance between any 2 points with characteristic length **d;**
  $\mu_v(p) = \exp(-1/2*(dp_{ij} / P_c)^2)$, P_c is a vertical characteristic parameter;

- the horizontal correlation function is defined only between points with snow observations, i.e. the snow analysis is an univariate analysis;
- the **rms observation error** is equal to **5 [kg.m^{-2}]** (or 5 mm liquid water equivalent of the snow quantity)

$$\sigma_o = 5\left[kgm^{-2}\right]$$

- the default value of the **rms guess error** is equal to the **rms observation error** .

The guess field is the snow quantity taken from the 6 hour forecast.
The model equivalent of the snow observation at the observation points (the vertical snow observation operator) is defined in Urban (1996) and is of the form :

$$E(x_o \mid x_h) = P_1\left[T_0 - T_{cl}(A)\right]\mid_{T_0 > T_{cl}(A)} + P_2\left[x_h - S_{cl}(G)/\sigma(G)\right]\left[T_0 - T(x)\right]\mid_{T_0 > T(x)}$$

with

P_1 = constant > 0 with dimension [kg.m^{-2}.K^{-1}];
P2 = constant > 0 with dimension [K^{-1}];
G - a portion of the surface corresponding to the real orography and representative of the area of validity of the model value x_h with measure $\sigma(G)$;
A - a small portion of the real surface around the obs. point with surface measure $\sigma(A)$;
S_{cl} (G) - climatology constant;
T_0 - the temperature threshold above which snow depth can not exist;
$T_{cl}(A)$ - obs operator for the surface temperature climatology at the observation area A;
T(x) - surface temperature obs operator computed at point x of the real orography.

To take into account the impact of the difference between the real and the model orography , $T_{cl}(A)$ and T(x) are defined by :

$$T_{cl}(A) = T^*_{cl}(A) + \lambda\left[z(A) - z(G)\right]$$

$$T(x) = T^*(G) + \lambda^*\left[z(A) - z(G)\right]$$

T^*_{cl} (A) - the climatology of the surface temperature ;
T*(G) - the model surface temperature;

λ - the standard vertical temperature gradient;

λ^* - the computed vertical temperature gradient;

z(A) , z(G) - the mean altitudes of the observation area A and area G resp.

There is no quality control (QC) for the snow observations, but they are checked against the guess field and rejected in case the limit parameters are exceeded. The observations pass also a check if there is a significant difference between the model orography and the altitude of the station. That check is controlled by the values of the parameters ORODIF and OROLIM. Observations, for which the above mentioned difference exceeds the values of those parameters, are eliminated.

SECTION II. Experiments with ARPEGE/CANARI

SECTION II.1 Experiments with the default values of the statistical model for the snow analysis

The experiments with ARPEGE/CANARI have been done for 2001/02/03/00 UTC. The guess field is presented in Fig.II.1, the distribution of the SYNOP observations with snow is show on Fig.II.2. It could be seen that the density of the snow observations is low, especially over Europe and Himalaya.

The first experiments have been performed with the snow obs operator of the form $H=H_h.H_v$, H_v being the vertical part, described in Section I, and the default values of the statistical model for the snow analysis, namely :

- the **rms observation error** is equal to the **rms guess error**

  $\sigma_o = \sigma_b = 5 \left[kgm^{-2} \right]$

- the horizontal characteristic length **d** is set to **d=50 000 [m] ;**

- the vertical characteristic parameter is set to $\mathbf{P_c = 0.05}$.

The results of the experiments are presented on TableII.1, which is a part of the typical CANARI output for the observation statistics before and after the analysis, and on Fig.II.3-Fig.II.6, on which the increments fields are visualized (for the whole globe and for the three main regions with observed snow quantities - Europe, Syberia and North America).
It could be seen that more than 40% of the observations have been rejected during the check against the guess field and that the analysis is very close to the guess.

SECTION II.2 Experiments with the "best ALADIN" values of the statistical model for the snow analysis

As described in Gaytandjieva et al(2001b), the best fit to the observations was achieved with the following statistical model :

- the **rms guess error** was considered to be bigger than the **rms observation error**

  $\sigma_b = 10 \left[kgm^{-2} \right]$

- the horizontal characteristic length was set **d=100 000 [m]**;
- the min correlation QCORMIN was set to **QCORMIN=0** (instead of the default value 0.1) and the max number of observations for a given sector NMXGQA was set to **NMXGQA=50** (instead of the default value 10).

The results of the ARPEGE/CANARI with that statistical model led to ill posed problem when solving the linear system of equations (TableII.2). For that reason the further experiments have been performed with the default value of QCORMIN.

From TableII.3 it is seen that in comparison with the "default statistical model", the number of the rejected observations is less both before and after the analysis, and that the observations have influenced the analysis more (the difference between the guess and the analysis is bigger as seen from the values of SN RES ANA and SN SIGA/SIGP). The annoying fact here is that after the analysis the number of the rejected observations is increased and the values of the bias (OBS-MOD) and rms analysis error (SIGMA) are increased as well.

The better pronounced difference between the guess and the analysis fields could be seen on Fig.II.7-Fig.II.10, where there are better defined areas in the increment field over the regions with more snow observations (Syberia and North America).

As far as in the snow analysis we want to be as close to the operational context as possible (which means to perform the analysis of several surface parameters (T_{2m}, Hu_{2m}, SST, etc) sometimes with the same code element to define the part of the statistical model) and because the number of the SYNOP with snow observations over some parts of the globe is bigger, we have performed an experiment with the default value of NMXGQA. As it could be seen from TableII.4 and Fig.11-Fig.14, the difference is small. For that reason the further experiments have been performed with **NMXGQA=10**.

SECTION II.3 Experiments with increased value of the horizontal characteristic length d

Due to the fact that we want to perform a global snow analysis, an experiment have been done with an increased value of the horizontal characteristic length (d was set to **d=200 000 [m]**).
As it coud be seen from TableII.5, the number of the rejected observations has decreased in comparison with the previous case, but after the analysis all the monitored parameters (rejected observations, the bias and the rms analysis error) are worse.
The increment fields show bigger differences between the analysis and the guess over Syberia and North America (Fig.II.15-Fig.II18).
To study the reason for the worse fit of the analysis to the observations we have put control prints in the routine ppobsn.F90. In TableII.6 the output for 2 stations (SID=21802 and SID=23274) is presented. It is seen that :

- at both obs points the snow climatology values are of the order of the guess values after the application of the horizontal snow obs operator;
- the analysis values at the observation points after the horizontal interpolation are smaller than the snow climatology values and the second term in the vertical snow obs operator produces negative values of the snow quantity at the observation points.

The study of the output from the subroutine CAVISO.F90 has shown that there are a lot of observations with unrealistic values of the difference OMN (obs - analysis) which could be explained by similar effects of the application of the snow vertical operator. The unrealistic values of the difference OMF (obs - guess) were smaller (for that particular case study) perhaps due to the fact that the guess field was closer to climatology.
Here should be mentioned, that for ALADIN experiments similar results have been obtained due to the big difference between the model orography and the real altitude of the SYNOP stations in some places.

SECTION II.4 Experiments with only the horizontal part of the snow obs operator

The experiments with ARPEGE/CANARI have been performed afterwards only with the horizontal part of the obs operator, while the difference between the model and real orography has been supposed to be taken into account by the vertical part of the correlation function and putting constraints on the difference between the model orography at the obs points and the altitudes of the SYNOP stations.
The results of those experiments are show on TableII.7 - TableII.10 and Fig.II.19 - Fig.II.34 for **d=200 000 [m]**.
On the Table II.7 and Fig.19-22 are presented the results of the snow analysis with only the horizontal part of the snow obs. operator.

It is seen that in that case after the analysis there is a decreasing of the percentage of the rejected points and the values of the bias (OBS-MOD) and the rms analysis error (SIGMA) are smaller.
The increments fields for all regions are smoother.
On TableII.8 and Fig.23-Fig.34 (Table II.9, Fig.27-Fig.30 and TableII.10,Fig.31-Fig.34 respectively) are presented the results of the experiments performed under the constraint **ORODIF=800 [m] (500, 300 [m]** respectively) .
It is seen that for all values of the ORODIF parameter the analysis better fits the observations, but the number of the excluded observations increases (it reaches 50% for the strongest constraint ORODIF=300 [m]) and the increment fields loose their gradients.

CONCLUSION

The results of the performed experiments have shown that the snow analysis within the frame of ARPEGE/CANARI gives reasonable results, but it is necessary to :

- tune the parameters of the statistical model with respect to the specific demands of a global analysis;
- try another formula for definition of the vertical snow operator;
- develop QC for the snow quantity.

At this stage the snow analysis has been evaluated according to the fit to the observations and the tuning of the parameters of the statistical model has been done to achieve a fit as close as possible. In case of an assimilation cycle perhaps it would be necessary to tune the parameters according to the demands for the best forecast scores.

ACKNOWLEDGMENTS

We are grateful to Elisabeth Gerard for the discussions of the results of the work and to Dominique Puech for her help in working with ODB, a new concept for the Observations Data Base.

REFERENCES

Cassé V., 1998 : Canari statistical model, version 03/98 (Personal communications).
L. Gaytandjieva, E. Gerard, F. Bouyssel , 2000a : "Update and validation of snow analysis in Canari / Aladin" (final report on the work done in Meteo-France during the time 15. 02 - 30. 03. 2000). Technical documentation.
L. Gaytandjieva, E. Gerard, F. Bouyssel , 2000b : "Validation of the snow analysis in CANARI/ALADIN" (final report on the work done in MeteoFrance during the time 18.09 - 18.11.2000). Technical documentation.
Urban B., 1996 : Coherent Observation Operators for Surface Data Assimilation with Application to Snow Depth. Journal of Applied Meteorology, vol. 35, No 2, February 1996.

Experiments with the default values of the statistical model for the snow analysis

Desription of the figures and tables

Fig.II.1 The guess field SN (in $kg.m^{-2}$) for 2001/02/03/00 UTC

Contour intervals: $\delta SN = 5$ ($kg.m^{-2}$) for $SN \subset [0,100]$

$\delta SN = 10$ ($kg.m^{-2}$) for $SN \subset [101,1000]$

$\delta SN = 1000$ ($kg.m^{-2}$) for $SN \subset [1001,10000]$

TableII.1 CANARI output

Fig.II.2 The distribution of the SYNOP stations with snow observations for 2001/02/03/00 UTC

Fig.II.3 - Fig.6 Increments fields over the globe, Europe, Syberia and North America respectively. Contour interval: 5 ($kg.m^{-2}$)

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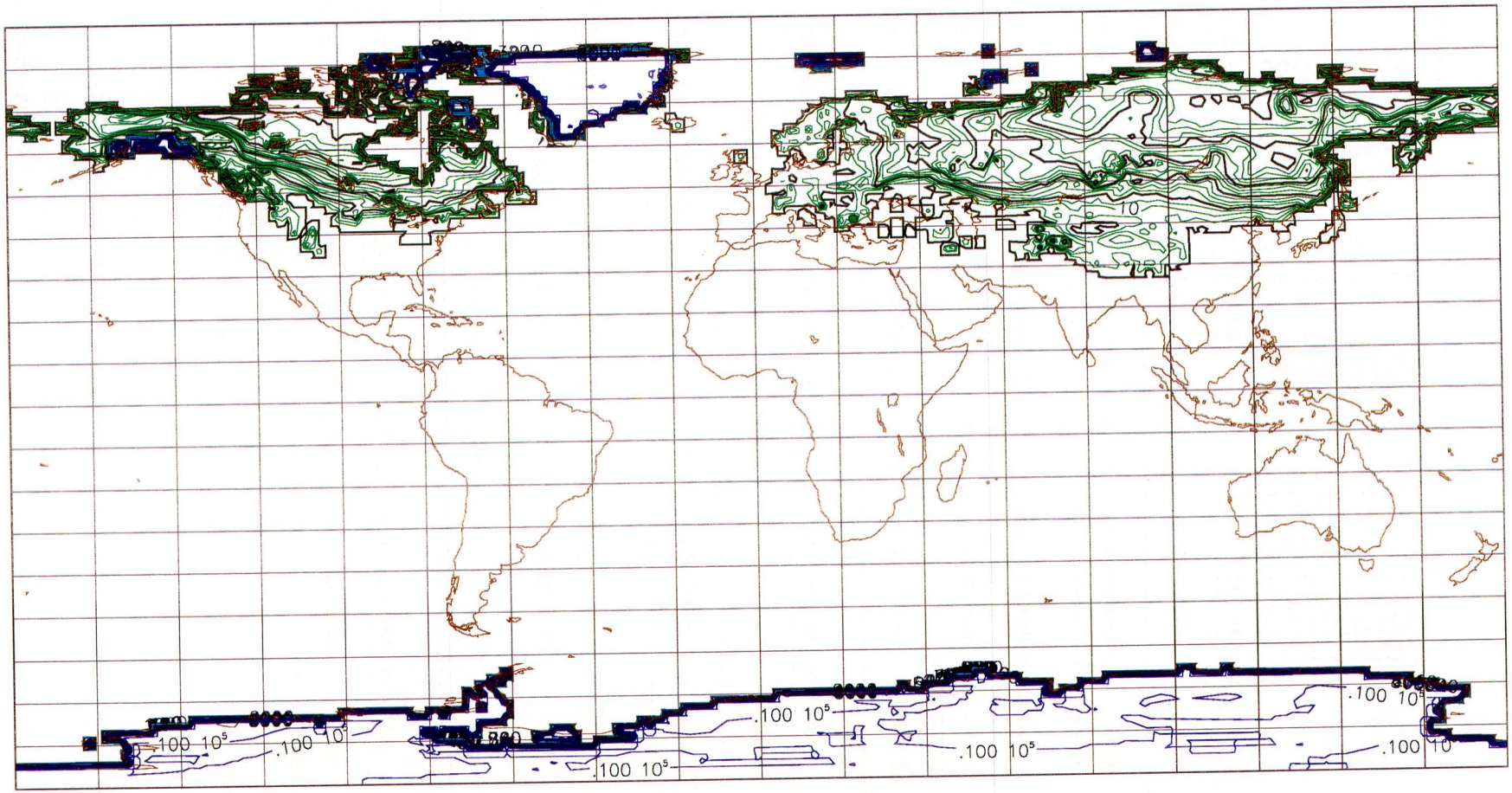
5 (20) 1000 (4000)



Before analysis

UANTITE DE NEIGE

WAGONS REJETES : 253 (42.9%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0) : 0 ELIMINES et 0 REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.753	SIGMA =	3.348 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.115	SIGMA =	2.470 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	-6.406	SIGMA =	52.768 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.221	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)

Renseignements fournis par CAIDGU pour le champ SN GUESS sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1475E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.8

Renseignements fournis par CAIDGU pour le champ SN ANALYSE sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1475E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.8

Renseignements fournis par CAIDGU pour le champ SN TAILLE SL sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.2146E-01	0.2285E+00	0.0000E+00	46.60	2.58	0.9000E+01	50.66	5.45

Renseignements fournis par CAIDGU pour le champ SN RES ANA sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	-.2773E-02	0.1886E+00	-.7639E+01	58.20	82.58	0.7402E+01	42.90	276.0

Renseignements fournis par CAIDGU pour le champ SN SIGA/SIGP sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.9989E+00	0.1376E-01	0.5297E+00	50.71	4.53	0.1000E+01	46.60	2.8

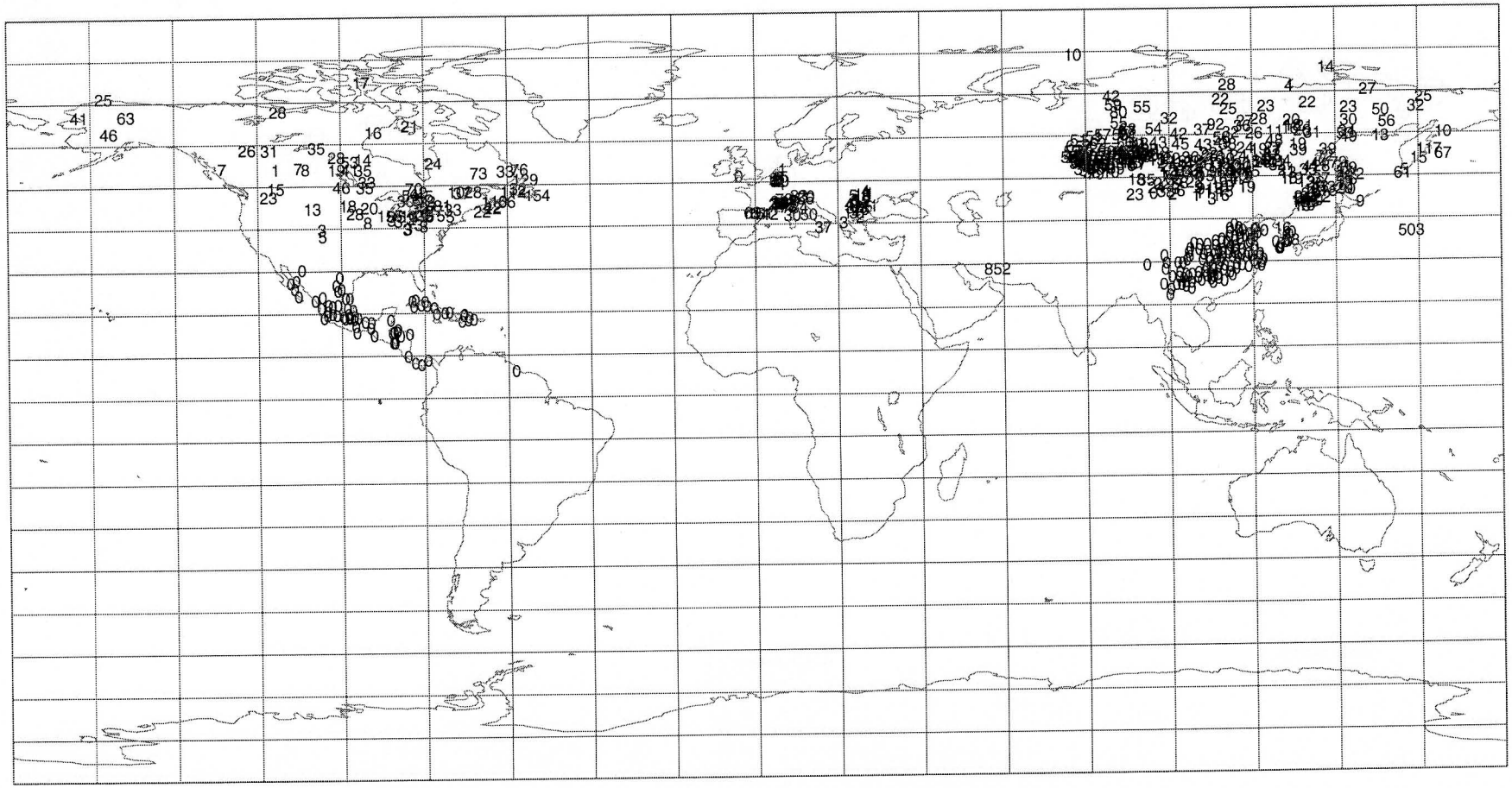
fter the analysis

UANTITE DE NEIGE

WAGONS REJETES : 271 (45.9%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0) : 0 ELIMINES et 0 REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.750	SIGMA =	3.347 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.098	SIGMA =	2.465 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	-4.412	SIGMA =	53.291 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.222	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)



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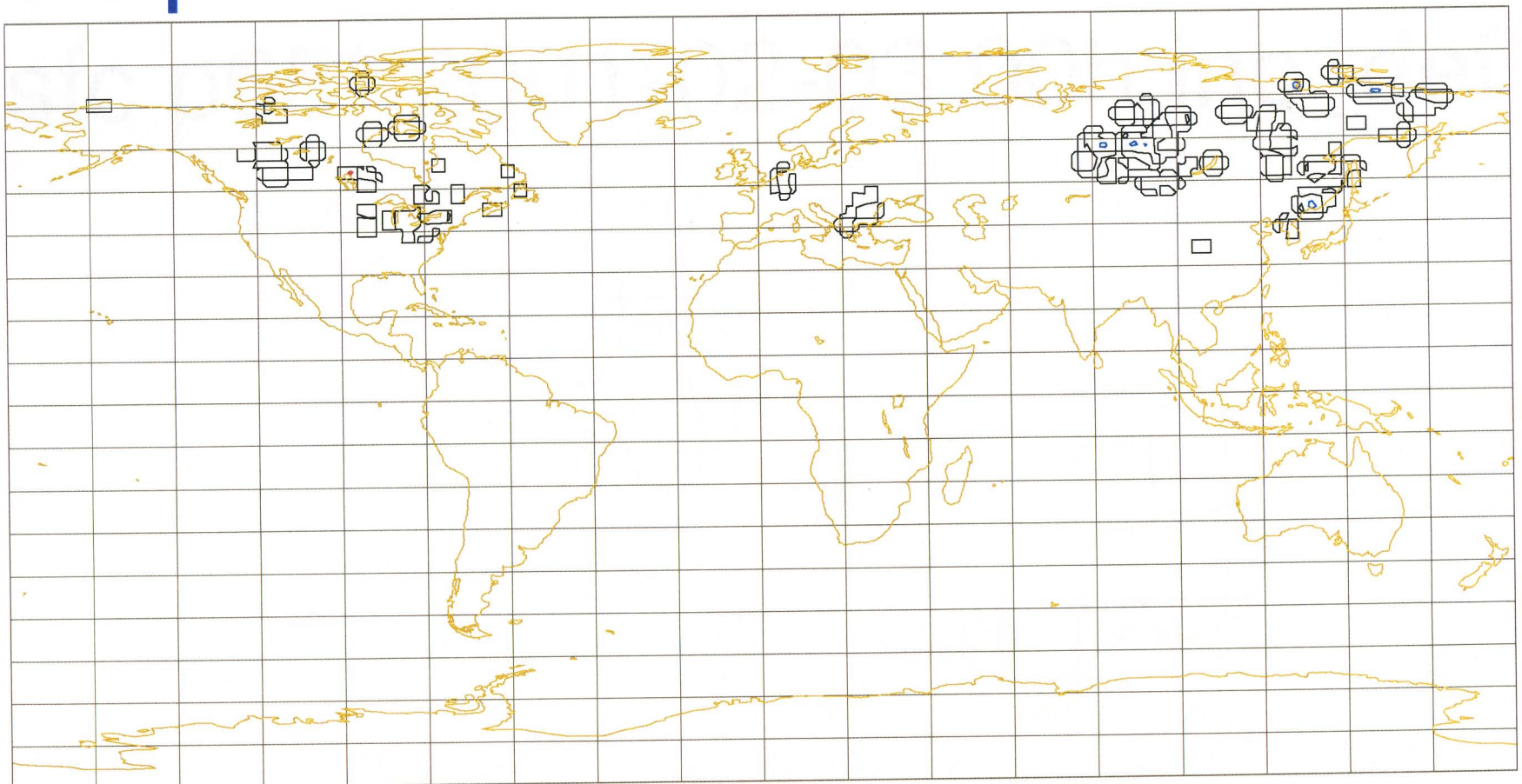

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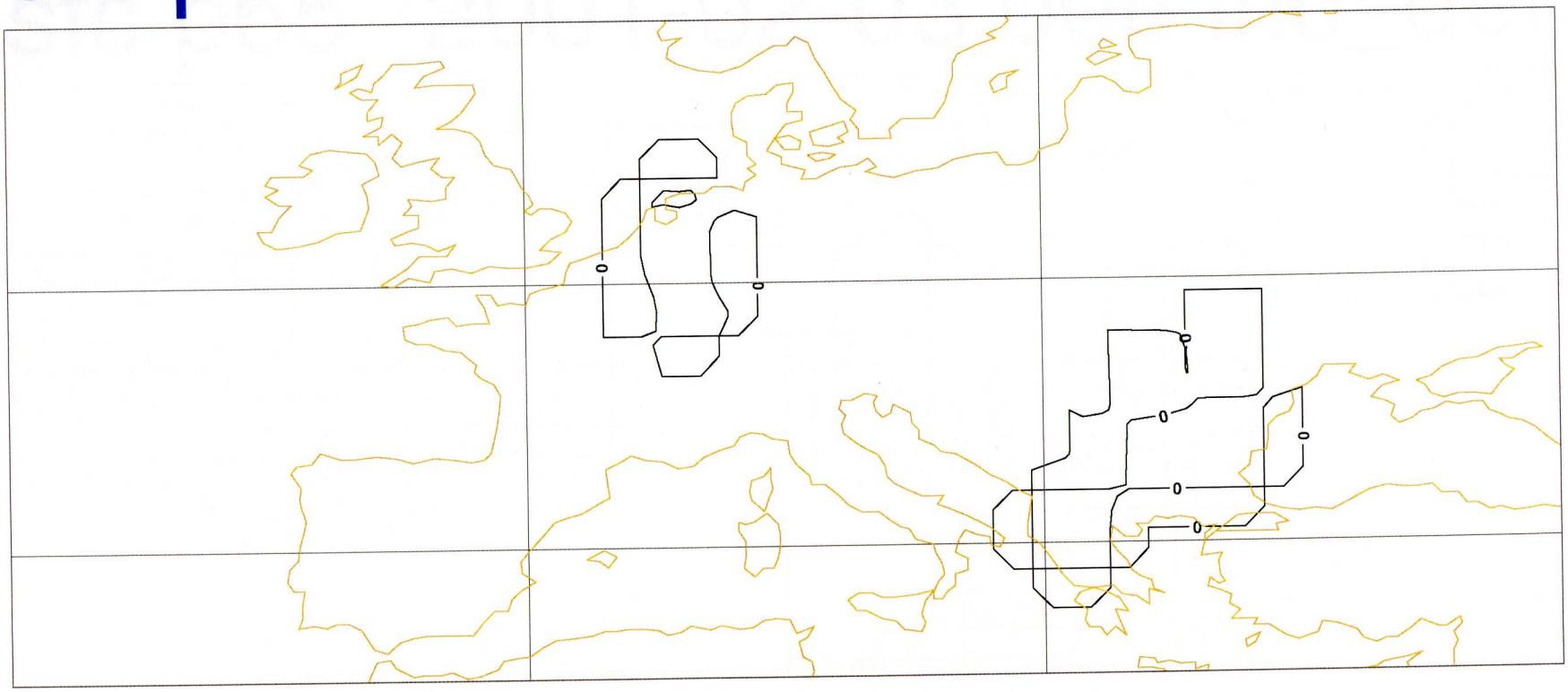

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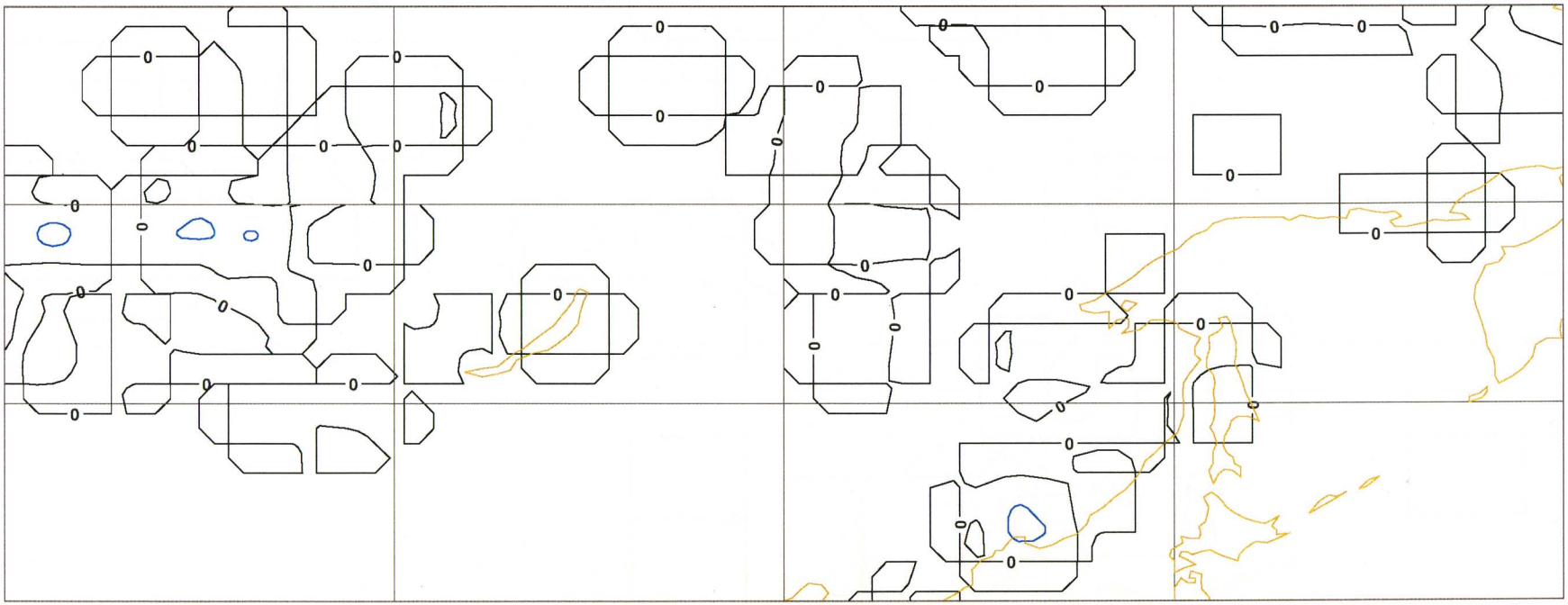

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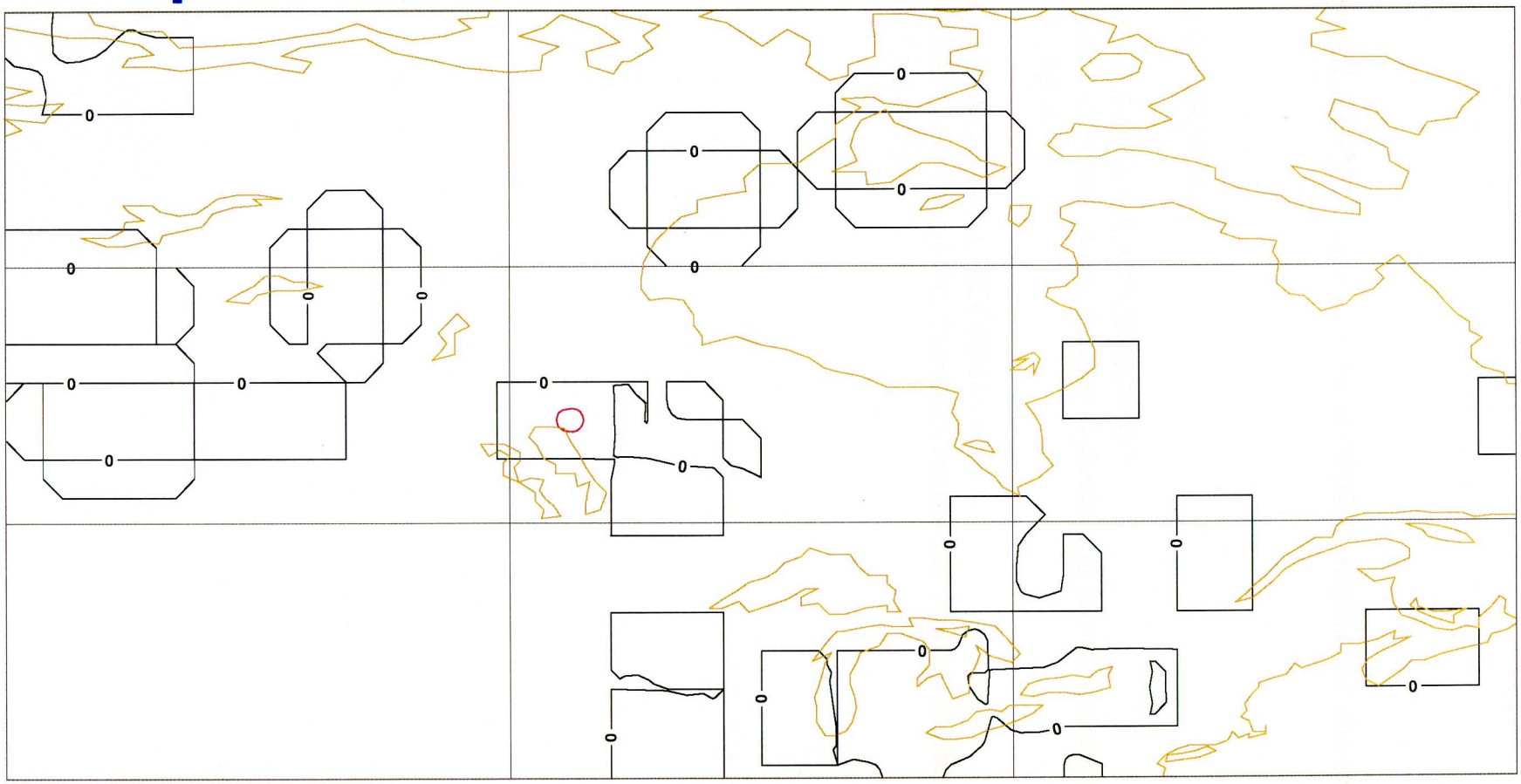

Experiments with the "best ALADIN" values of the statistical model for the snow analysis

TableII.2 CANARI output for QCORMIN=0.

TableII.3 CANARI output for NMXGQA=50, QCORMIN=0.1
Fig.II.7 - Fig.10 Increments fields over the globe, Europe,Syberia and North America respectively. Contour interval: 5 ($kg.m^{-2}$)

TableII.4 CANARI output for NMXGQA=10, QCORMIN=0.1
Fig.II.11 - Fig.14 Increments fields over the globe, Europe,Syberia and North America respectively. Contour interval: 5 ($kg.m^{-2}$)

Before analysis

UANTITE DE NEIGE

WAGONS REJETES : 184 (31.2%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0
0 ELIMINES et 0
REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.753	SIGMA =	3.348 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.115	SIGMA =	2.470 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	-6.406	SIGMA =	52.768 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.221	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)

CALL ABOR1 CANADA SYSTEM LINEAR

Before analysis

UANTITE DE NEIGE

WAGONS REJETES : 184 (31.2%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0) :
0 ELIMINES et 0
REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.753	SIGMA =	3.348 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.115	SIGMA =	2.470 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	-6.406	SIGMA =	52.768 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.221	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)

Renseignements fournis par CAIDGU pour le champ SN GUESS sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1475E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.78

Renseignements fournis par CAIDGU pour le champ SN ANALYSE sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1474E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.78

Renseignements fournis par CAIDGU pour le champ SN TAILLE SL sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1058E+00	0.7019E+00	0.0000E+00	46.60	2.58	0.1100E+02	49.81	6.09

Renseignements fournis par CAIDGU pour le champ SN RES ANA sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	-.4054E-01	0.1058E+01	-.2413E+02	56.96	93.25	0.2260E+02	43.05	279.34

Renseignements fournis par CAIDGU pour le champ SN SIGA/SIGP sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.9935E+00	0.4674E-01	0.2529E+00	50.66	4.74	0.1000E+01	46.60	2.58

After analysis

UANTITE DE NEIGE

WAGONS REJETES : 234 (39.7%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0) :
0 ELIMINES et 0
REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.750	SIGMA =	3.347 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.098	SIGMA =	2.465 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	15.272	SIGMA =	71.503 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.221	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)

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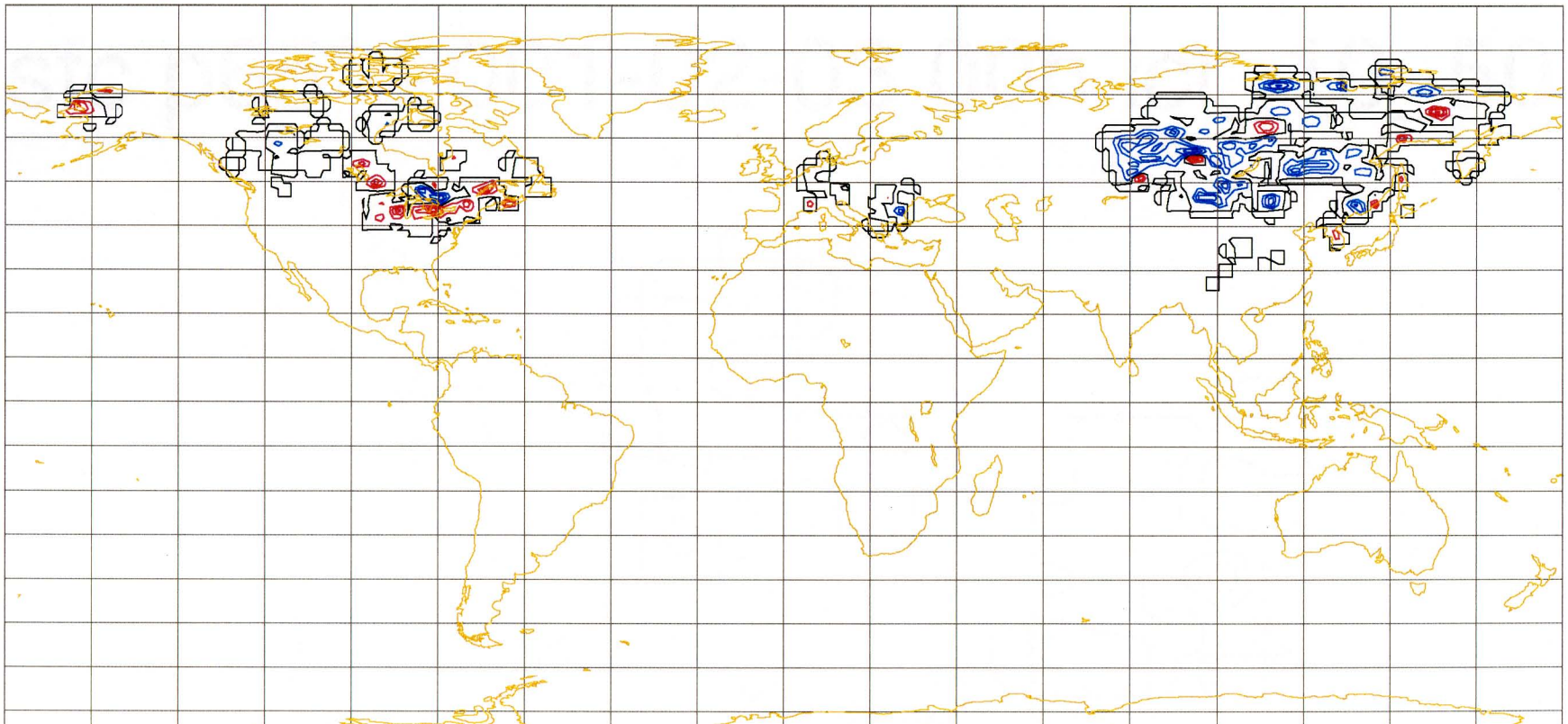

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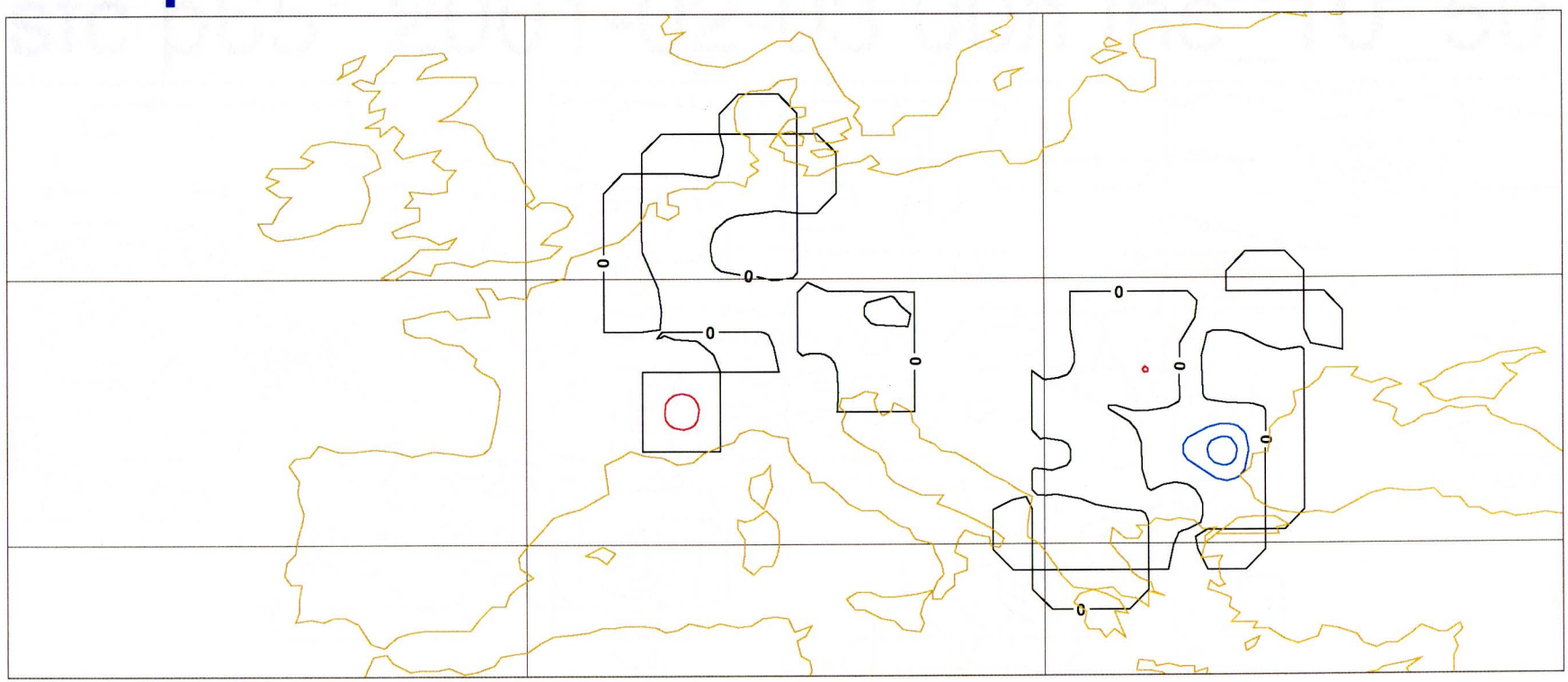

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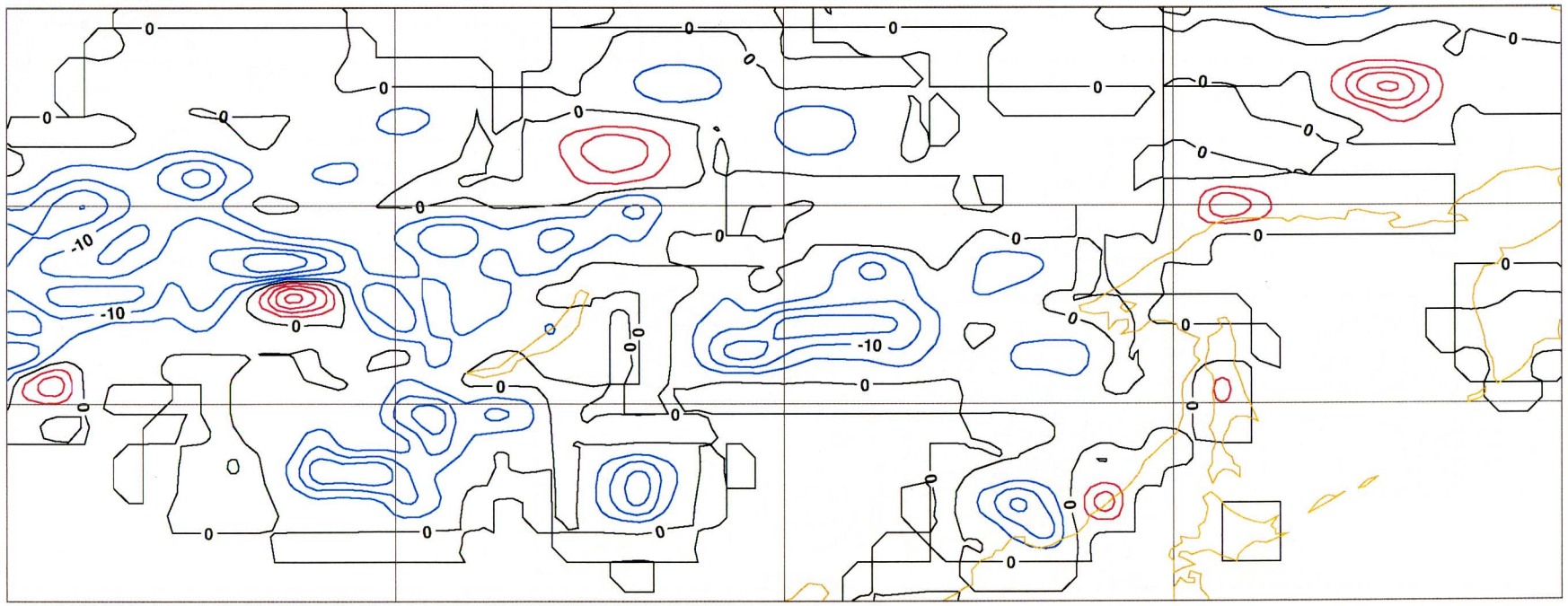
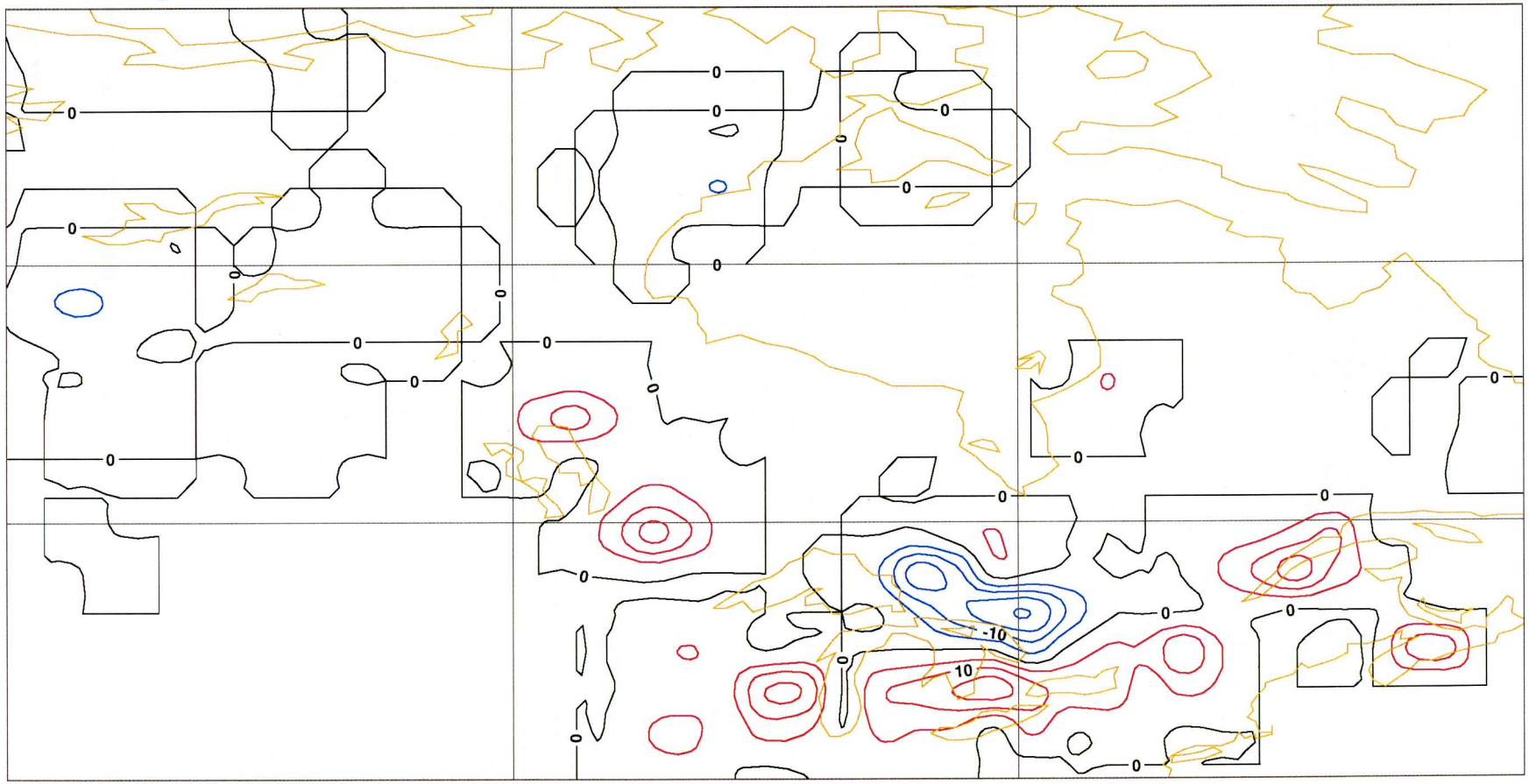


sfc p65* 2001-02-03 00h inc_10_50



Before analysis

UANTITE DE NEIGE

WAGONS REJETES : 184 (31.2%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0) :
0 ELIMINES et 0
REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.753	SIGMA =	3.348 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.115	SIGMA =	2.470 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	-6.406	SIGMA =	52.768 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.221	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)

Renseignements fournis par CAIDGU pour le champ SN GUESS sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1475E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.8

Renseignements fournis par CAIDGU pour le champ SN ANALYSE sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1474E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.8

Renseignements fournis par CAIDGU pour le champ SN TAILLE SL sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.8987E-01	0.6023E+00	0.0000E+00	46.60	2.58	0.1100E+02	50.47	6.01

Renseignements fournis par CAIDGU pour le champ SN RES ANA sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	-.4224E-01	0.1055E+01	-.2413E+02	56.96	93.25	0.2260E+02	43.05	279.34

Renseignements fournis par CAIDGU pour le champ SN SIGA/SIGP sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.9937E+00	0.4652E-01	0.2536E+00	50.66	4.74	0.1000E+01	46.60	2.58

After analysis

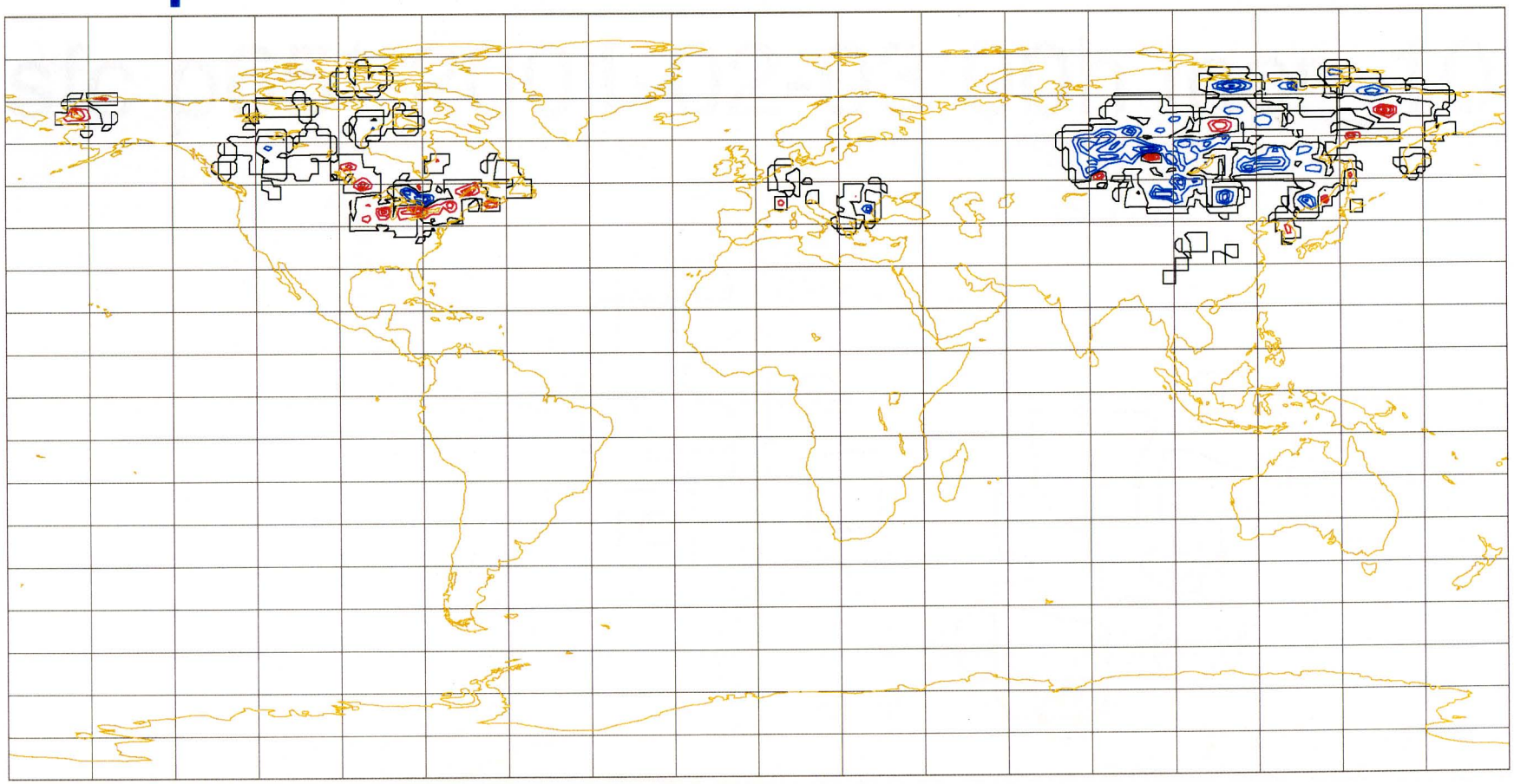
UANTITE DE NEIGE

WAGONS REJETES : 234 (39.7%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0) :
0 ELIMINES et 0
REJETES (0.0%)

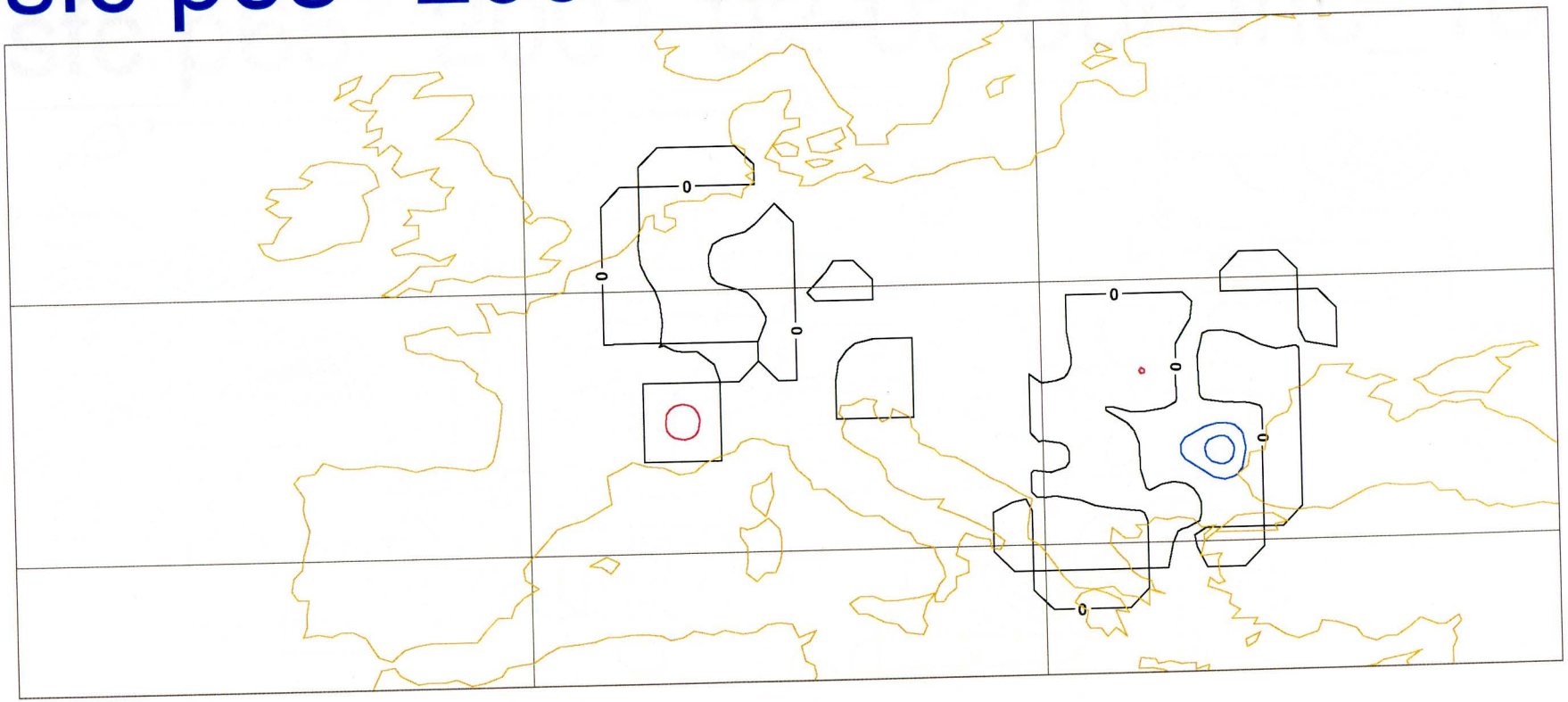
Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.750	SIGMA =	3.347 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.098	SIGMA =	2.465 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	15.275	SIGMA =	71.504 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.221	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)

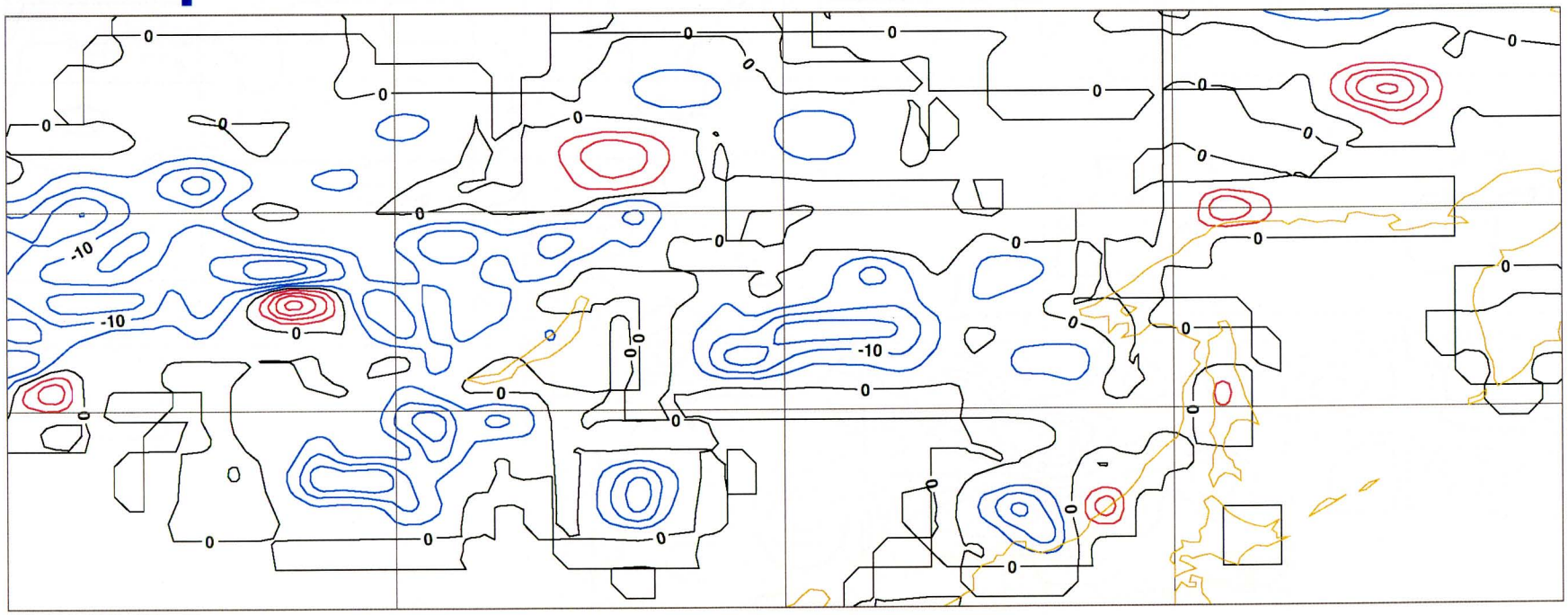
sfc p65* 2001-02-03 00h incr_10



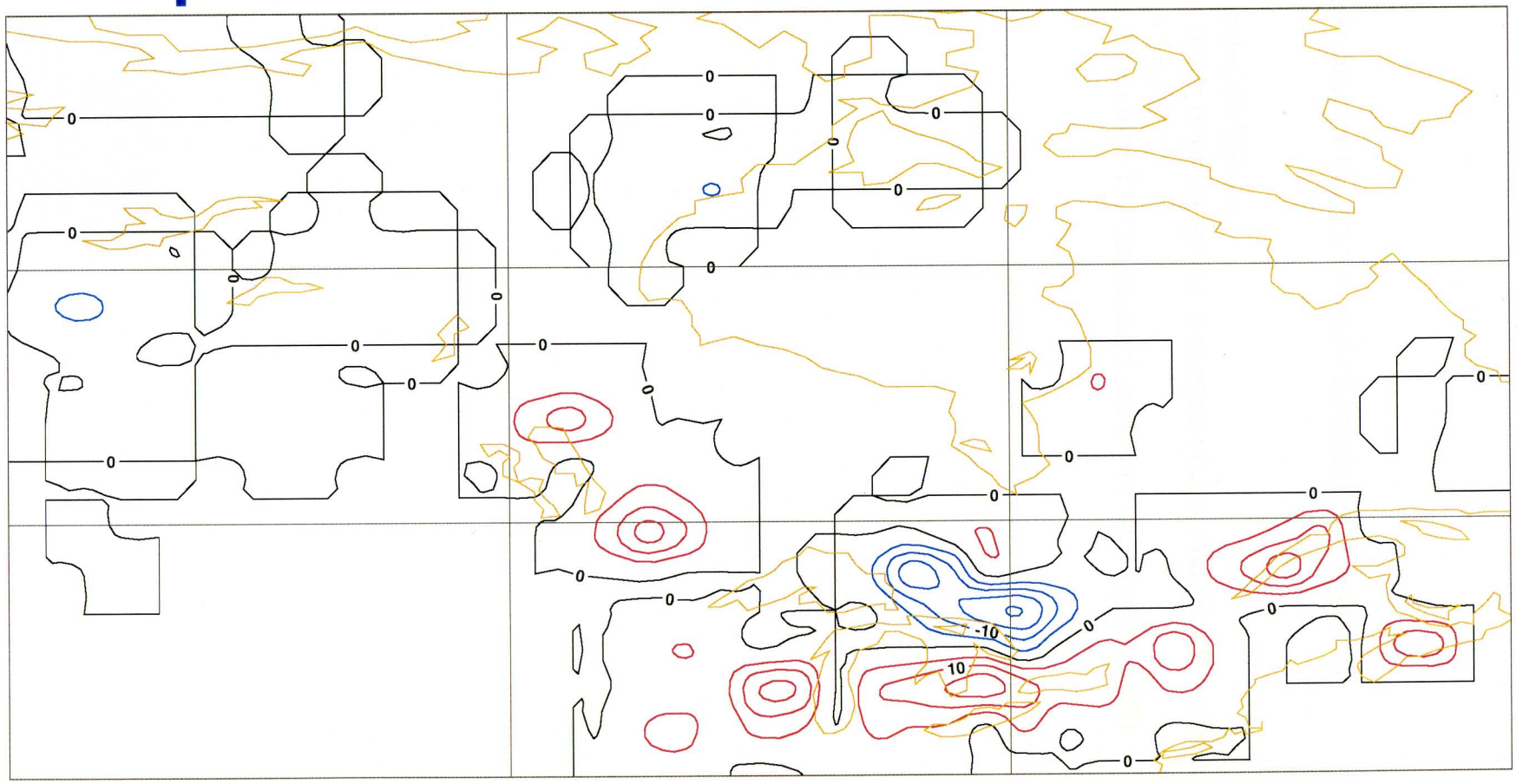
sfc p65* 2001-02-03 00h incr_10



sfc p65* 2001-02-03 00h inc_10



sfc p65* 2001-02-03 00h inc_10



Experiments with increased value of the horizontal characteristic length d

TableII.5 CANARI output for d=200 000 (m)
Fig.II.15 - Fig.18 Increments fields over the globe, Europe,Syberia and North America respectively. Contour interval: 5 ($kg.m^{-2}$)
TableII.6 Control prints from the routine for the vertical snow operator ppobsn.F90

Before analysis

UANTITE DE NEIGE

WAGONS REJETES : 62 (10.5%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0) :
0 ELIMINES et 0 RE
JETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.753	SIGMA =	3.348 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.115	SIGMA =	2.470 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	-6.406	SIGMA =	52.768 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.221	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)

Renseignements fournis par CAIDGU pour le champ SN GUESS sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1475E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.8

Renseignements fournis par CAIDGU pour le champ SN ANALYSE sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1473E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.8

Renseignements fournis par CAIDGU pour le champ SN TAILLE SL sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1191E+00	0.7122E+00	0.0000E+00	46.60	2.58	0.1300E+02	56.10	92.34

Renseignements fournis par CAIDGU pour le champ SN RES ANA sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	-.2044E+00	0.2686E+01	-.5163E+02	44.24	134.97	0.3832E+02	53.53	139.96

Renseignements fournis par CAIDGU pour le champ SN SIGA/SIGP sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.9901E+00	0.6538E-01	0.1439E+00	50.71	4.53	0.1000E+01	46.60	2.8

After analysis

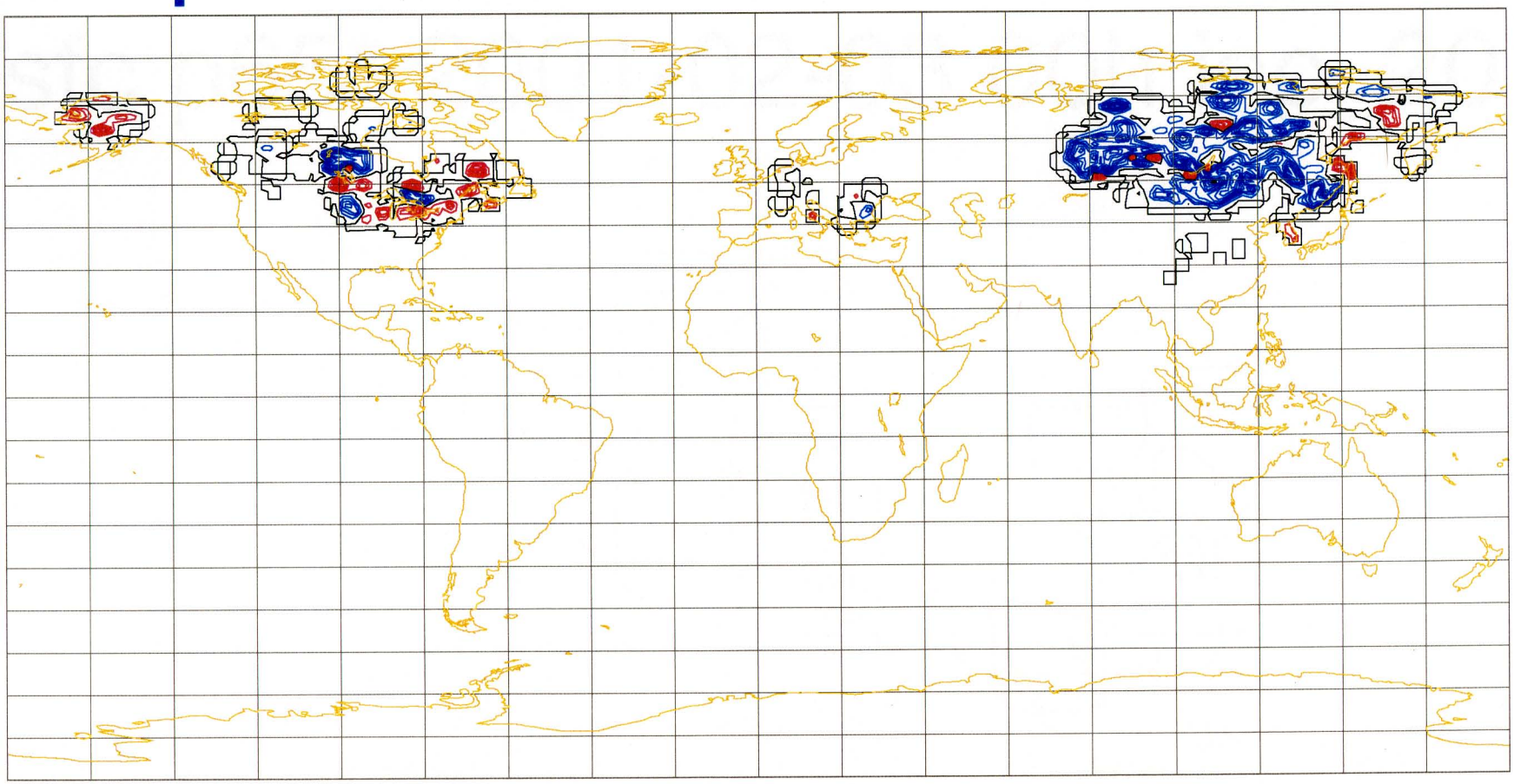
UANTITE DE NEIGE

WAGONS REJETES : 231 (39.2%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0) :
0 ELIMINES et 0 RE
ETES (0.0%)

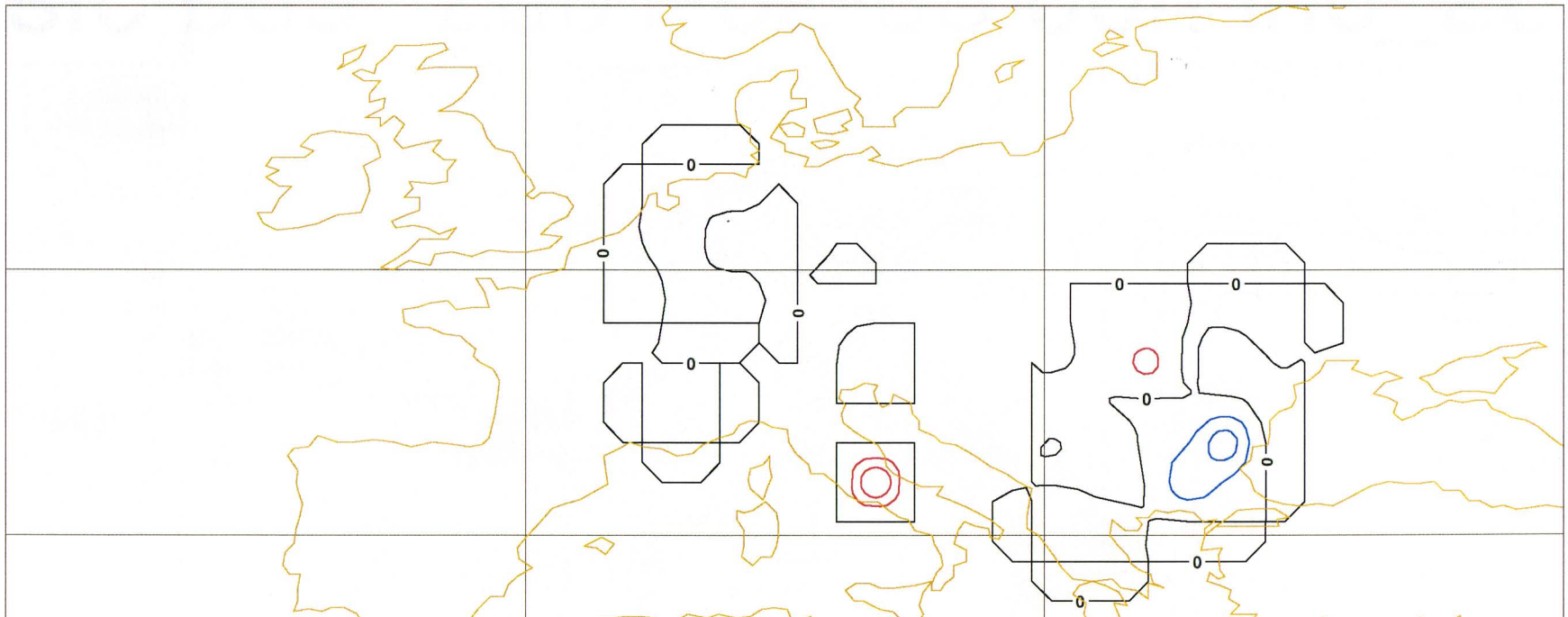
Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.750	SIGMA =	3.347 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.098	SIGMA =	2.465 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	74.525	SIGMA =	147.864 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.221	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)

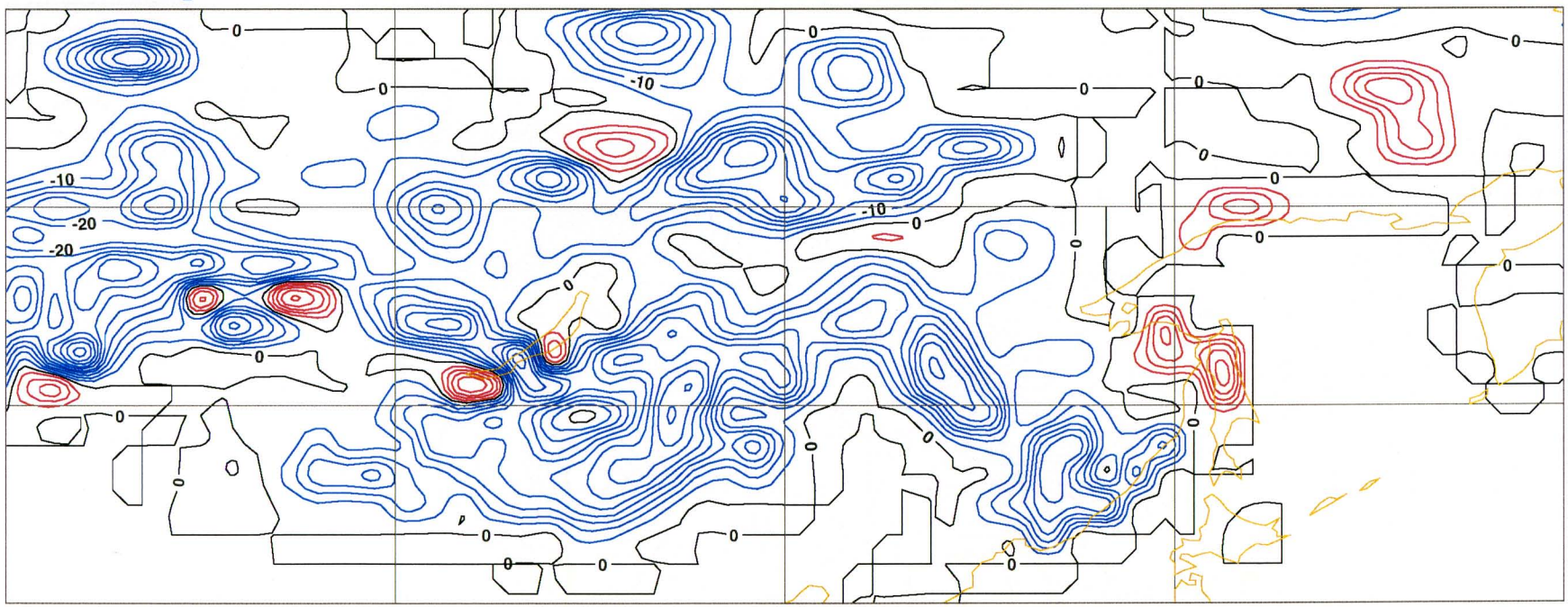
sfc p65* 2001-02-03 00h inc_20



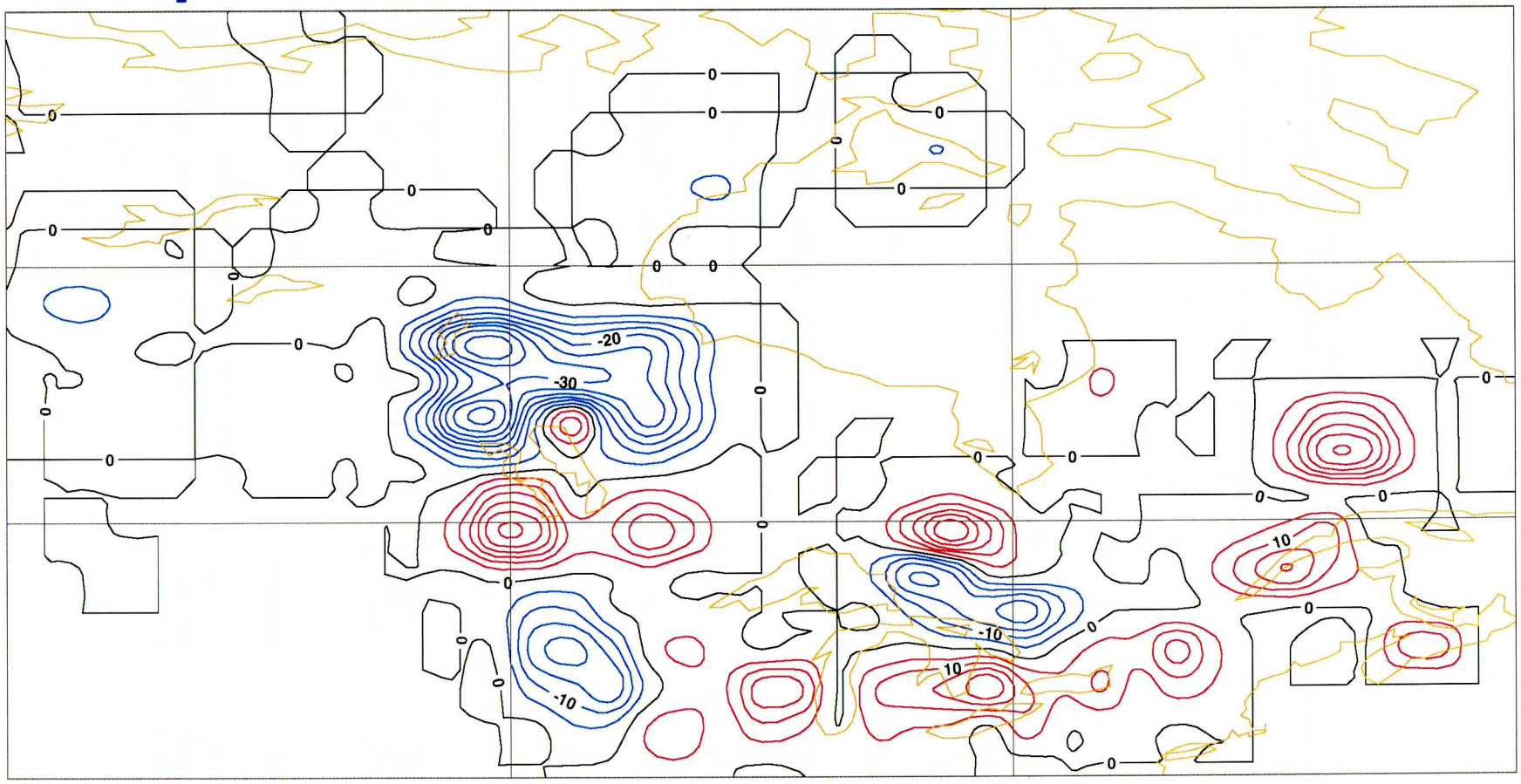
sfc p65* 2001-02-03 00h inc_20



sfc p65* 2001-02-03 00h inc_20



sfc p65* 2001-02-03 00h inc_20



constants

RG= 9.806649999999999 [m/s**2]
RD= 287.0596736665907 [J/kg K] - specific constant for dry air
RDTDZ1= -6.5 E-03 [K/m] - the standard vertical temperature gradient below the tropopause
RTT= 273.16 [K] - the tripple point temperature
TR = RTT + 3.0 [K] - the temperature threshold above which snow depth can not exist

Analysed variable

snow quantity [kg/m2]**

SID	**21802**	**23274**
Mean orography at the obs. point [J/kg] **PALTI** (JROF)	**235.359**	**294.199**
Mean model orography at the obs.point [J/kg] **POROG** (JROF)	**1171.12**	**1003.0**
Temperature of the last model level at the obs.point **PTF5**(JROF,**NFLEVG**)	**249.38**	**228.788**
Postprocessed temperature at the obs. point **ZTOBS** = **PTF5**(JROF,**NFLEVG**)+**ZDTDZ** * (**PALTI**(JROF)-**POROG**(JROF))/**RG**	**250.**	**229.258**
Climatology of the surf temperatute at the obs.point **ZCCLITS**(JROF)	**235.96**	**245.09**
Postprocessed climatology of the surf temperature at the obs.point **ZTCLIMA** = **ZCCLITS**(JROF) + **RDTDZ** * (**PALTI**(JROF)-**POROG**(JROF))/**RG**	**236.58**	**245.56**
Climatology of the snow quantity at the obs.point **ZCCLISN**(JROF)	**89.17**	**80.91**
Guess (model) value of the snow quantity at the obs.point **ZSNS**(JROF)	**93.21**	**86.81**
Postprocessed value of the model snow quantity at the obs.point **ZPXPP1** = **_HALF_*MAX**(**_ZERO_**,**TR - ZTCLIMA**)	**19.787**	**15.297**
ZPXPP2 =(**ZSNS**(JROF) - **ZCCLISNS**(JROF))***MAX**(**_ZERO_**,**TR - ZTOBS**)/3	**35.212**	**92.16**
PXPP(JROF,1,1) = **ZPXPP1** + **ZPXPP2**	**54.996**	**107.457**
Analyses value of the snow quantity at the obs.point **ZSNS**(JROF)	**68.408**	**43.01**
Postprocessed value of the analysed snow quantity at the obs.point **ZPXPP1** = **_HALF_*MAX**(**_ZERO_**,**TR - ZTCLIMA**)	**19.78**	**15.297**
ZPXPP2 =(**ZSNS**(JROF) - **ZCCLISNS**(JROF))***MAX**(**_ZERO_**,**TR - ZTOBS**)/3	**-181.04**	**-592.51**
PXPP(JROF,1,1) = **ZPXPP1** + **ZPXPP2**	**-161.25**	**-577.21**

Experiments with only the horizontal part of the snow obs operator

TableII.7 CANARI output for ORODIF=90000 (default)
Fig.II.19 - Fig.22 Increments fields over the globe, Europe,Syberia and North America respectively. Contour interval: 5 ($kg.m^{-2}$)

TableII.8 CANARI output for ORODIF=800 (m)
Fig.II.23 - Fig.26 Increments fields over the globe, Europe,Syberia and North America respectively. Contour interval: 5 ($kg.m^{-2}$)

TableII.9 CANARI output for ORODIF=500 (m)
Fig.II.27 - Fig.30 Increments fields over the globe, Europe,Syberia and North America respectively. Contour interval: 5 ($kg.m^{-2}$)

TableII.10 CANARI output for ORODIF=300 (m)
Fig.II.31 - Fig.34 Increments fields over the globe, Europe,Syberia and North America respectively. Contour interval: 5 ($kg.m^{-2}$)

Before analysis

UANTITE DE NEIGE

WAGONS REJETES : 70 (11.9%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0) : 0 ELIMINES et 0 REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.753	SIGMA =	3.348 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.115	SIGMA =	2.470 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	-4.064	SIGMA =	53.864 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.221	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)

Renseignements fournis par CAIDGU pour le champ SN GUESS sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1475E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.8

Renseignements fournis par CAIDGU pour le champ SN ANALYSE sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1474E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.8

Renseignements fournis par CAIDGU pour le champ SN TAILLE SL sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1196E+00	0.7577E+00	0.0000E+00	46.60	2.58	0.1500E+02	54.74	79.01

Renseignements fournis par CAIDGU pour le champ SN RES ANA sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	-.8050E-01	0.2247E+01	-.5264E+02	50.31	115.26	0.4206E+02	45.86	6.89

Renseignements fournis par CAIDGU pour le champ SN SIGA/SIGP sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.9903E+00	0.6558E-01	0.1439E+00	50.71	4.53	0.1000E+01	46.60	2.8

After analysis

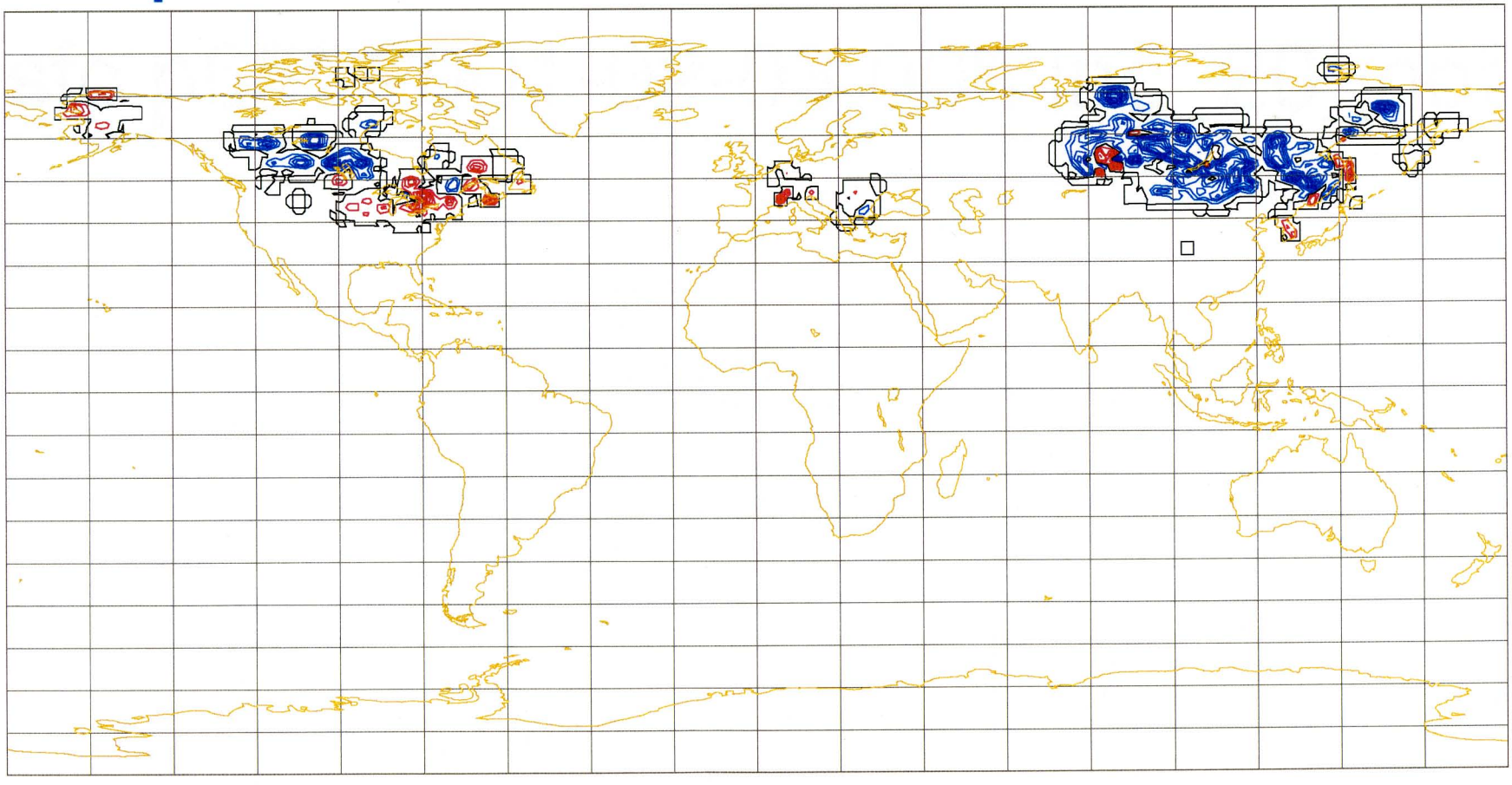
UANTITE DE NEIGE

WAGONS REJETES : 57 (9.7%) plus 3 ELIMINES (0.5%) - LISTE NOIRE (0) : 0 ELIMINES et 0 REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-15.423	SIGMA =	276.223 (05112)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.057	SIGMA =	0.163 (05428)
TEMPERATURE A 2M	OBS-MOD =	-0.750	SIGMA =	3.347 (05748)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.098	SIGMA =	2.465 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.704	SIGMA =	1.661 (03647)
QUANTITE DE NEIGE	OBS-MOD =	0.201	SIGMA =	50.332 (00590)
VENT U A 10M	OBS-MOD =	-0.014	SIGMA =	2.690 (05555)
VENT V A 10M	OBS-MOD =	0.221	SIGMA =	2.578 (05555)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03627)

sfc p65* 2001-02-03 00h inc_20_nof



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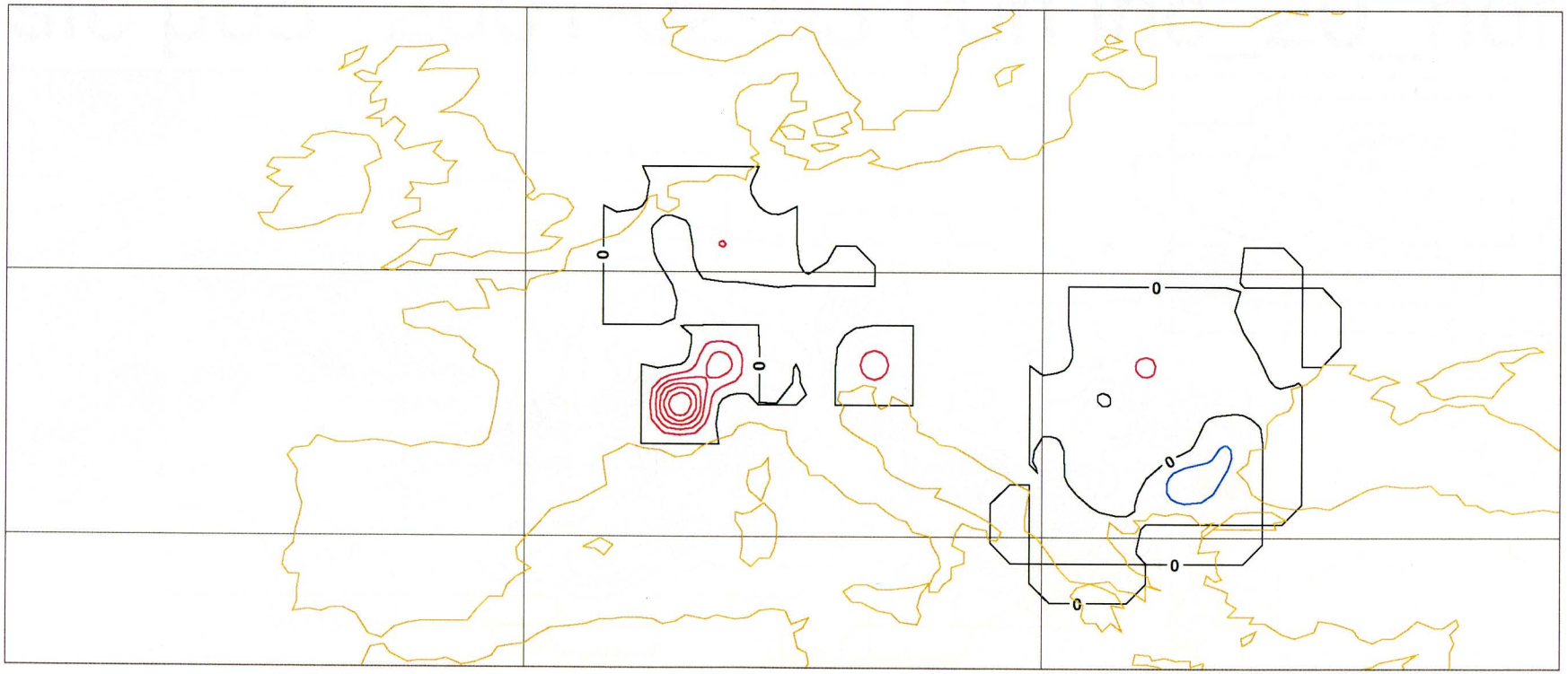
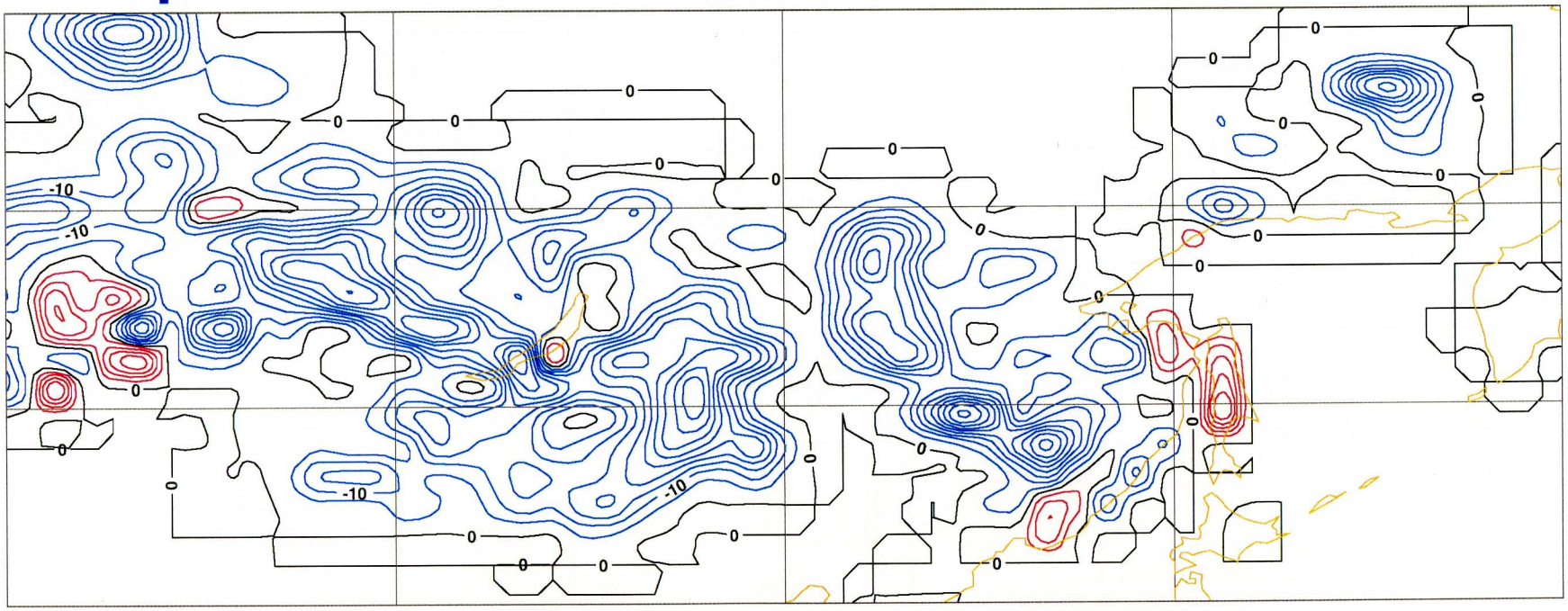


sfc p65* 2001-02-03 00h inc_20_nof



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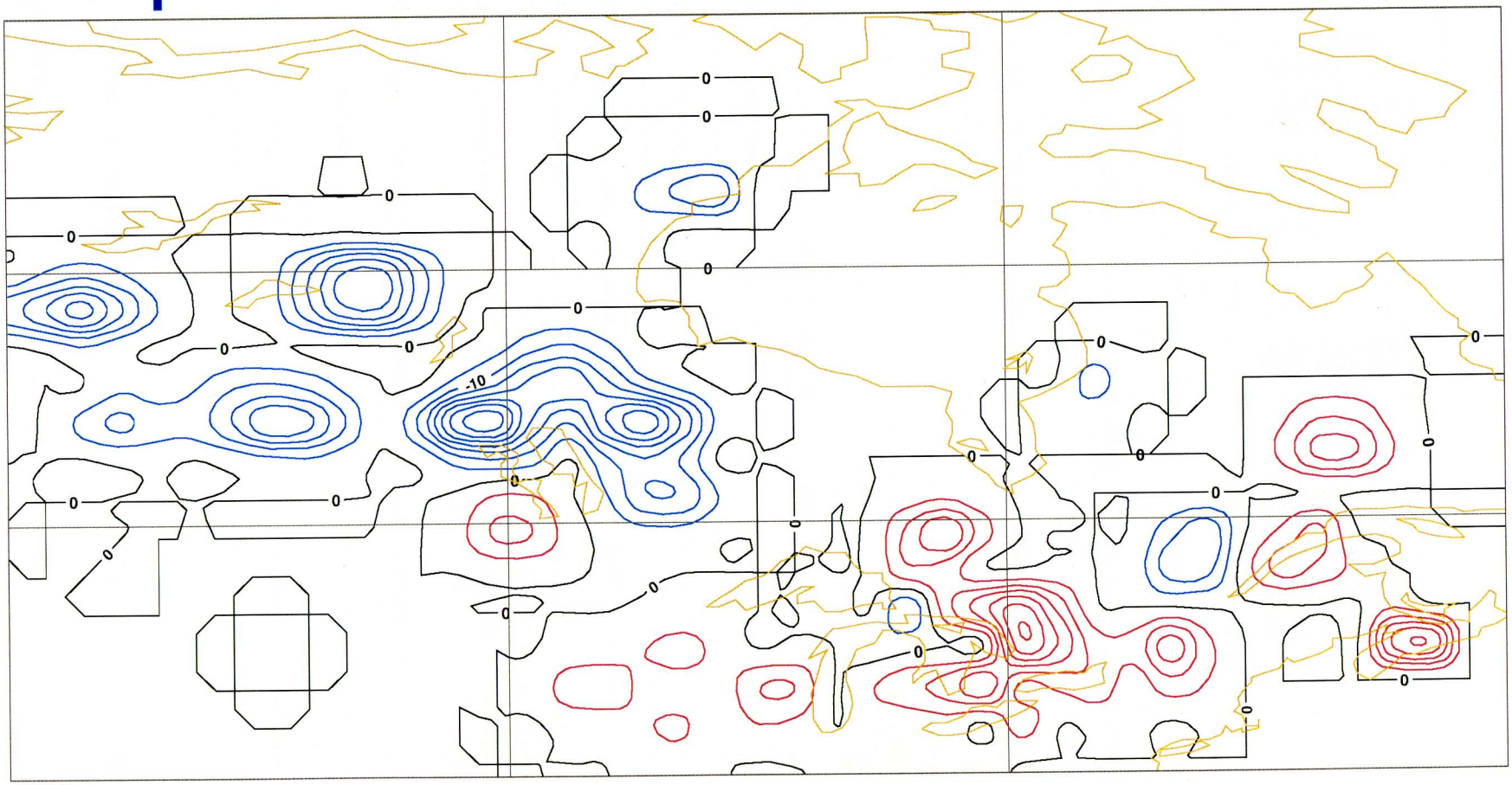


Before analysis

UANTITE DE NEIGE

WAGONS REJETES : 68 (12.5%) plus 47 ELIMINES (8.6%) - LISTE NOIRE (0) : 0 ELIMINES et 0 REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-18.341	SIGMA =	260.776 (04853)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.054	SIGMA =	0.159 (05134)
TEMPERATURE A 2M	OBS-MOD =	-0.706	SIGMA =	3.257 (05448)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.115	SIGMA =	2.470 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.682	SIGMA =	1.629 (03409)
QUANTITE DE NEIGE	OBS-MOD =	-3.567	SIGMA =	55.495 (00546)
VENT U A 10M	OBS-MOD =	0.014	SIGMA =	2.714 (05262)
VENT V A 10M	OBS-MOD =	0.243	SIGMA =	2.584 (05262)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03384)

Renseignements fournis par CAIDGU pour le champ SN GUESS sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1475E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.

Renseignements fournis par CAIDGU pour le champ SN ANALYSE sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1474E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.

Renseignements fournis par CAIDGU pour le champ SN TAILLE SL sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1158E+00	0.7508E+00	0.0000E+00	46.60	2.58	0.1500E+02	54.74	79.

Renseignements fournis par CAIDGU pour le champ SN RES ANA sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	-.8986E-01	0.2191E+01	-.5264E+02	50.31	115.26	0.4206E+02	45.86	6.

Renseignements fournis par CAIDGU pour le champ SN SIGA/SIGP sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.9906E+00	0.6509E-01	0.1439E+00	50.71	4.53	0.1000E+01	46.60	2.

After analysis

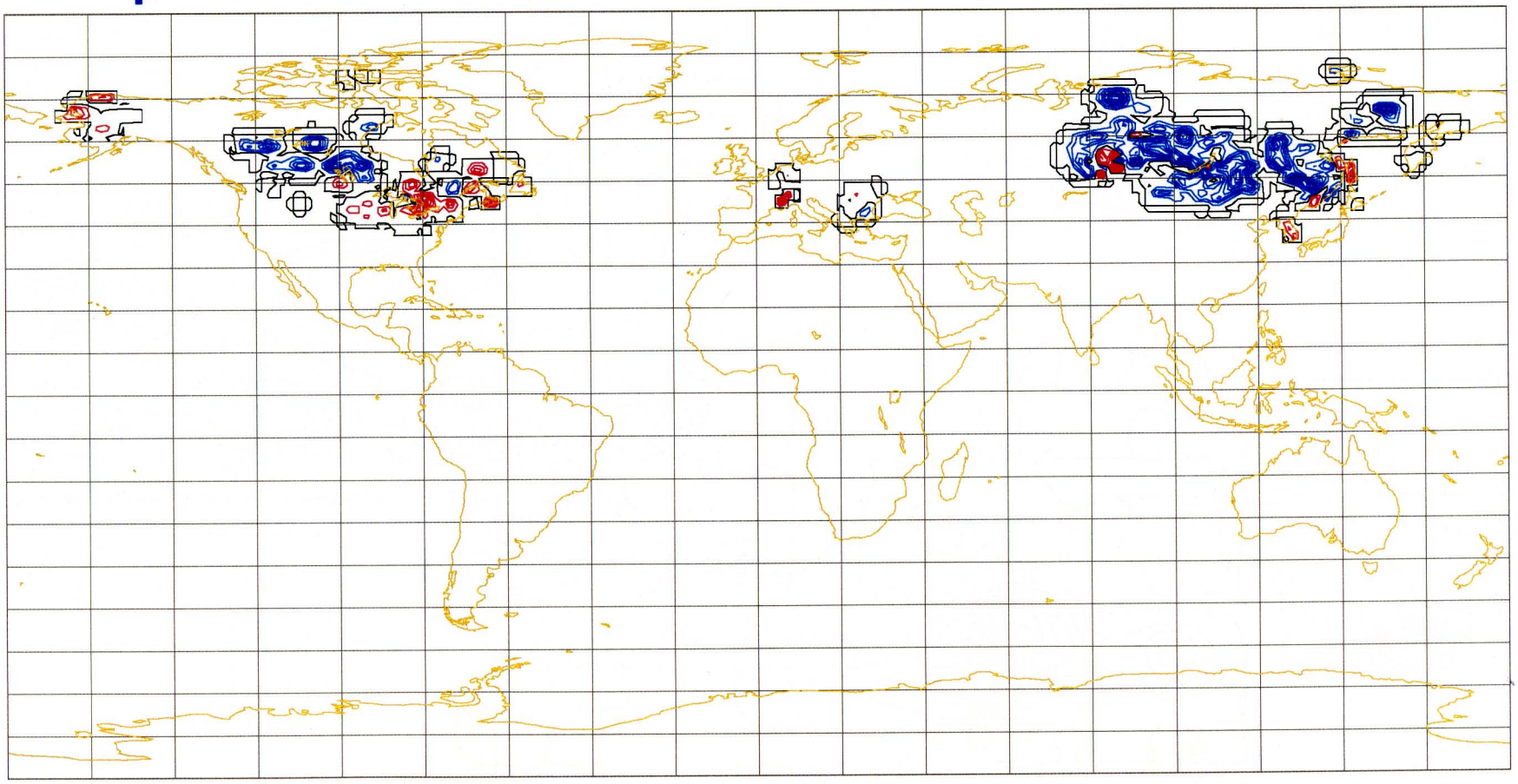
UANTITE DE NEIGE

WAGONS REJETES : 55 (10.1%) plus 47 ELIMINES (8.6%) - LISTE NOIRE (0) : 0 ELIMINES et 0 REJETES (0.0%)

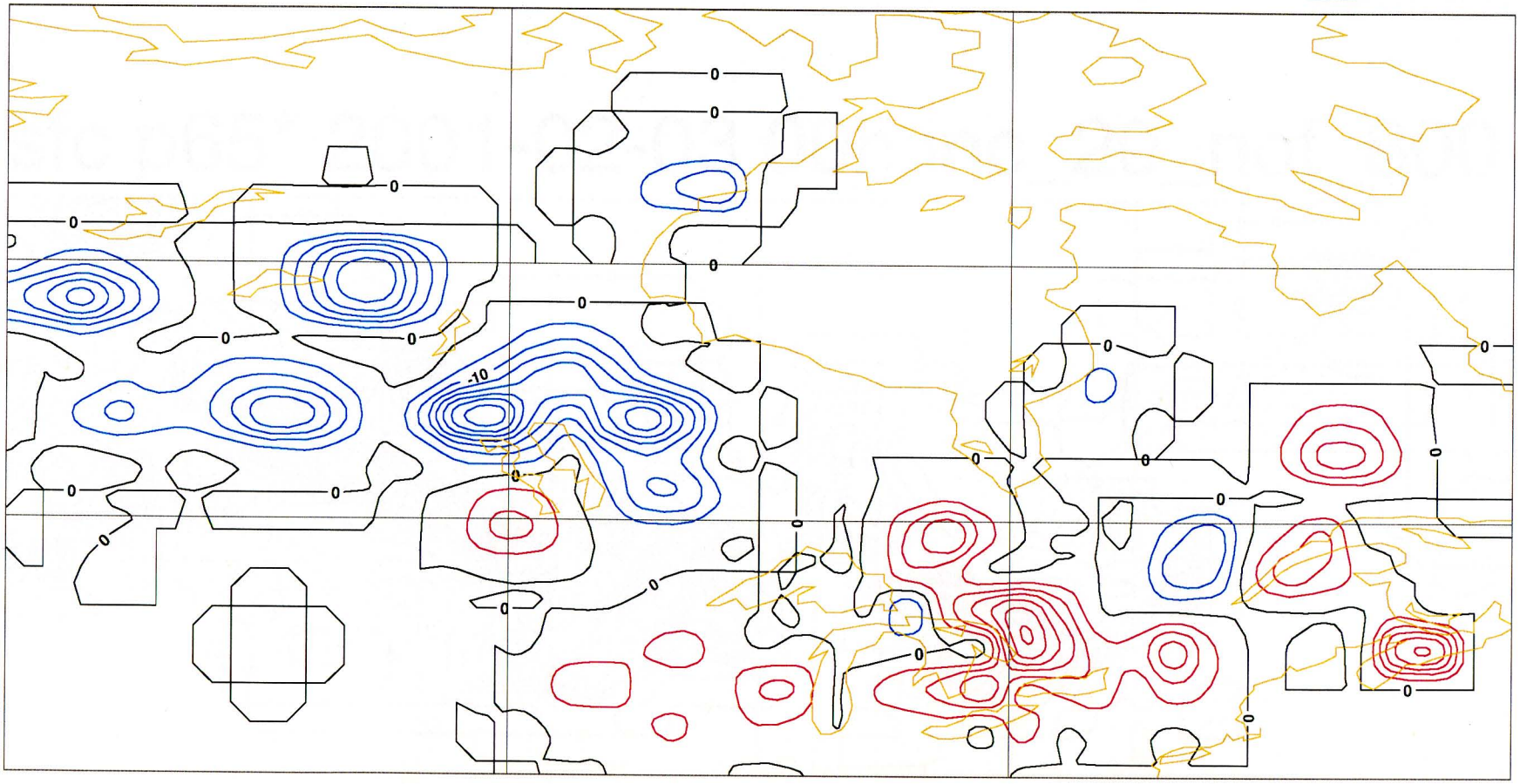
Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-18.341	SIGMA =	260.776 (04853)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.054	SIGMA =	0.159 (05134)
TEMPERATURE A 2M	OBS-MOD =	-0.703	SIGMA =	3.256 (05448)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.098	SIGMA =	2.465 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.682	SIGMA =	1.629 (03409)
QUANTITE DE NEIGE	OBS-MOD =	0.989	SIGMA =	51.845 (00546)
VENT U A 10M	OBS-MOD =	0.014	SIGMA =	2.714 (05262)
VENT V A 10M	OBS-MOD =	0.243	SIGMA =	2.584 (05262)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03384)

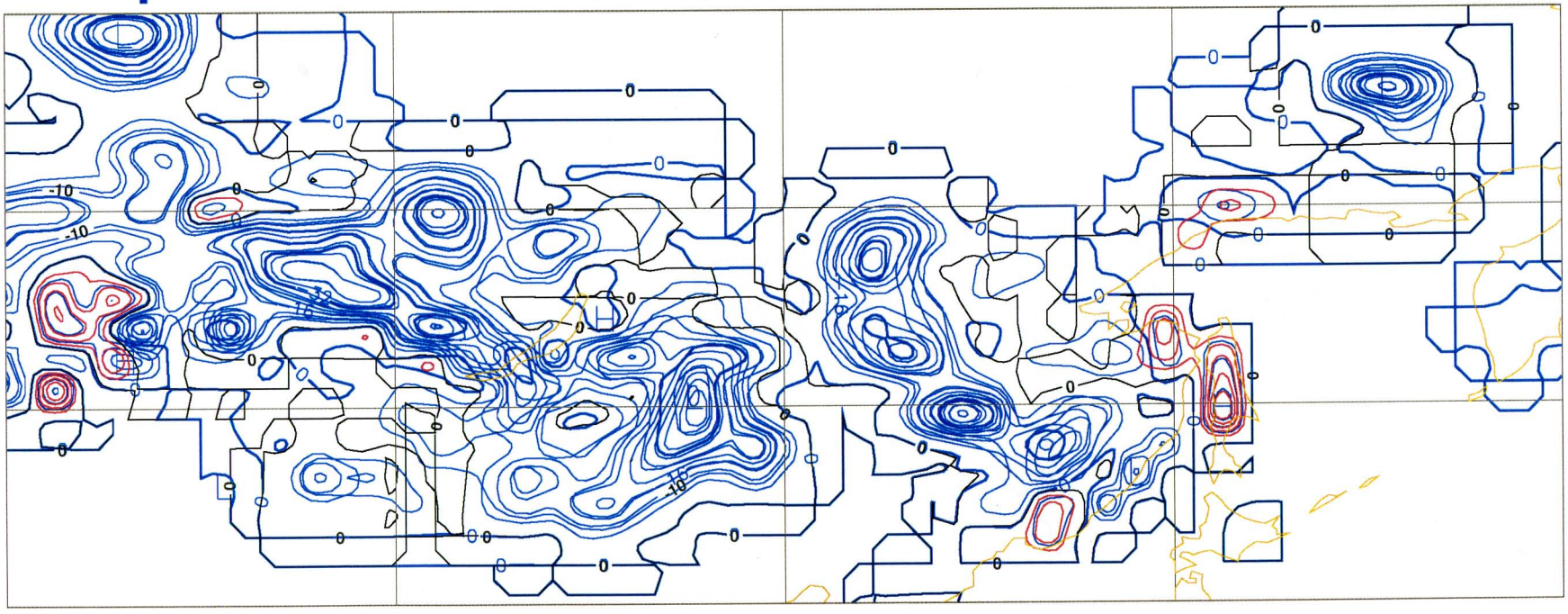
sfc p65* 2001-02-03 00h inc_20_nof_800



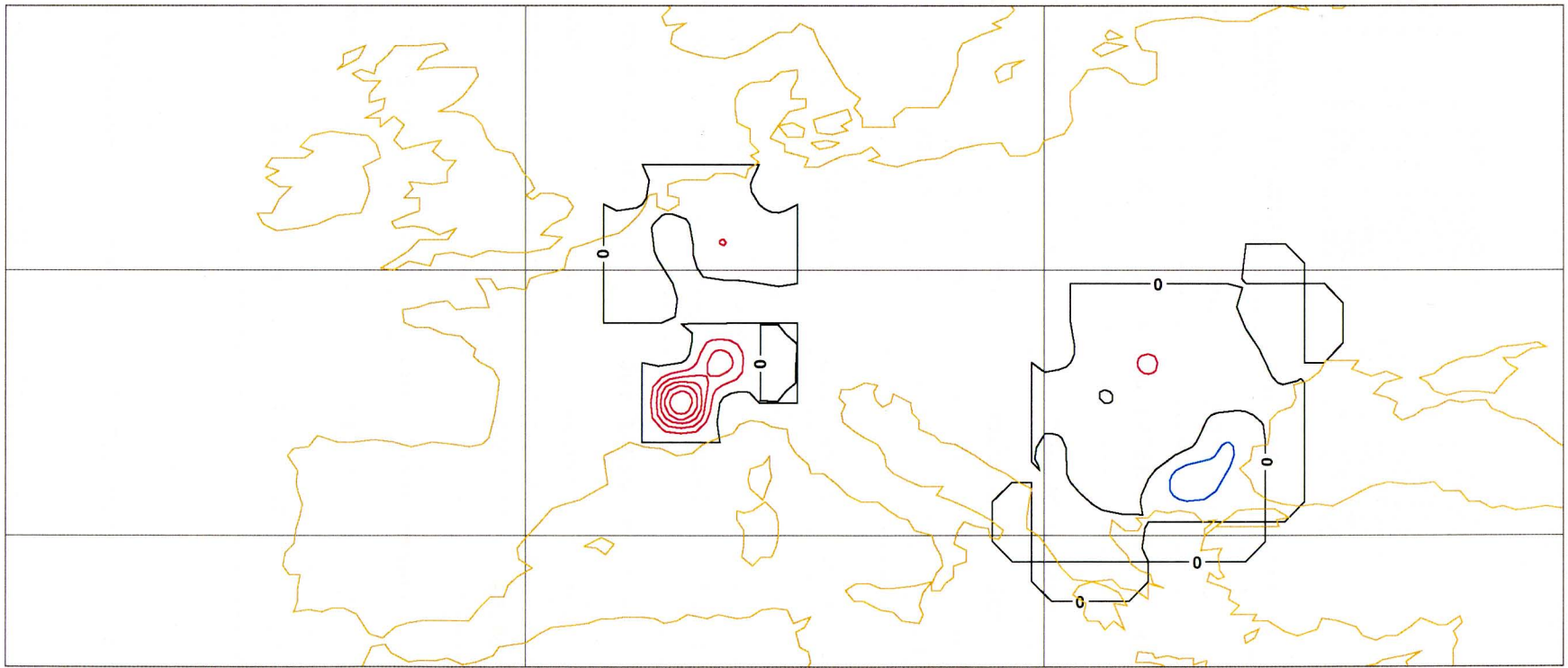
sfc p65* 2001-02-03 00h inc_nof_800



sfc p65* 2001-02-03 00h inc_20_nof_800



sfc p65* 2001-02-03 00h inc_20_nof_800



Before analysis

QUANTITE DE NEIGE

WAGONS REJETES : 64 (13.3%) plus 113 ELIMINES (23.5%) - LISTE NOIRE (0) :
0 ELIMINES et 0 REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-17.441	SIGMA =	256.571 (04559)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.053	SIGMA =	0.156 (04819)
TEMPERATURE A 2M	OBS-MOD =	-0.700	SIGMA =	3.251 (05117)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.115	SIGMA =	2.470 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.689	SIGMA =	1.628 (03148)
QUANTITE DE NEIGE	OBS-MOD =	-4.797	SIGMA =	43.802 (00480)
VENT U A 10M	OBS-MOD =	0.008	SIGMA =	2.703 (04937)
VENT V A 10M	OBS-MOD =	0.267	SIGMA =	2.584 (04937)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03137)

Renseignements fournis par CAIDGU pour le champ SN GUESS sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1475E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.

Renseignements fournis par CAIDGU pour le champ SN ANALYSE sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1474E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.

Renseignements fournis par CAIDGU pour le champ SN TAILLE SL sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1098E+00	0.7339E+00	0.0000E+00	46.60	2.58	0.1500E+02	54.74	79.

Renseignements fournis par CAIDGU pour le champ SN RES ANA sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	-.9295E-01	0.2148E+01	-.5264E+02	50.31	115.26	0.4206E+02	45.86	6.

Renseignements fournis par CAIDGU pour le champ SN SIGA/SIGP sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.9909E+00	0.6438E-01	0.1439E+00	50.71	4.53	0.1000E+01	46.60	2.

After analysis

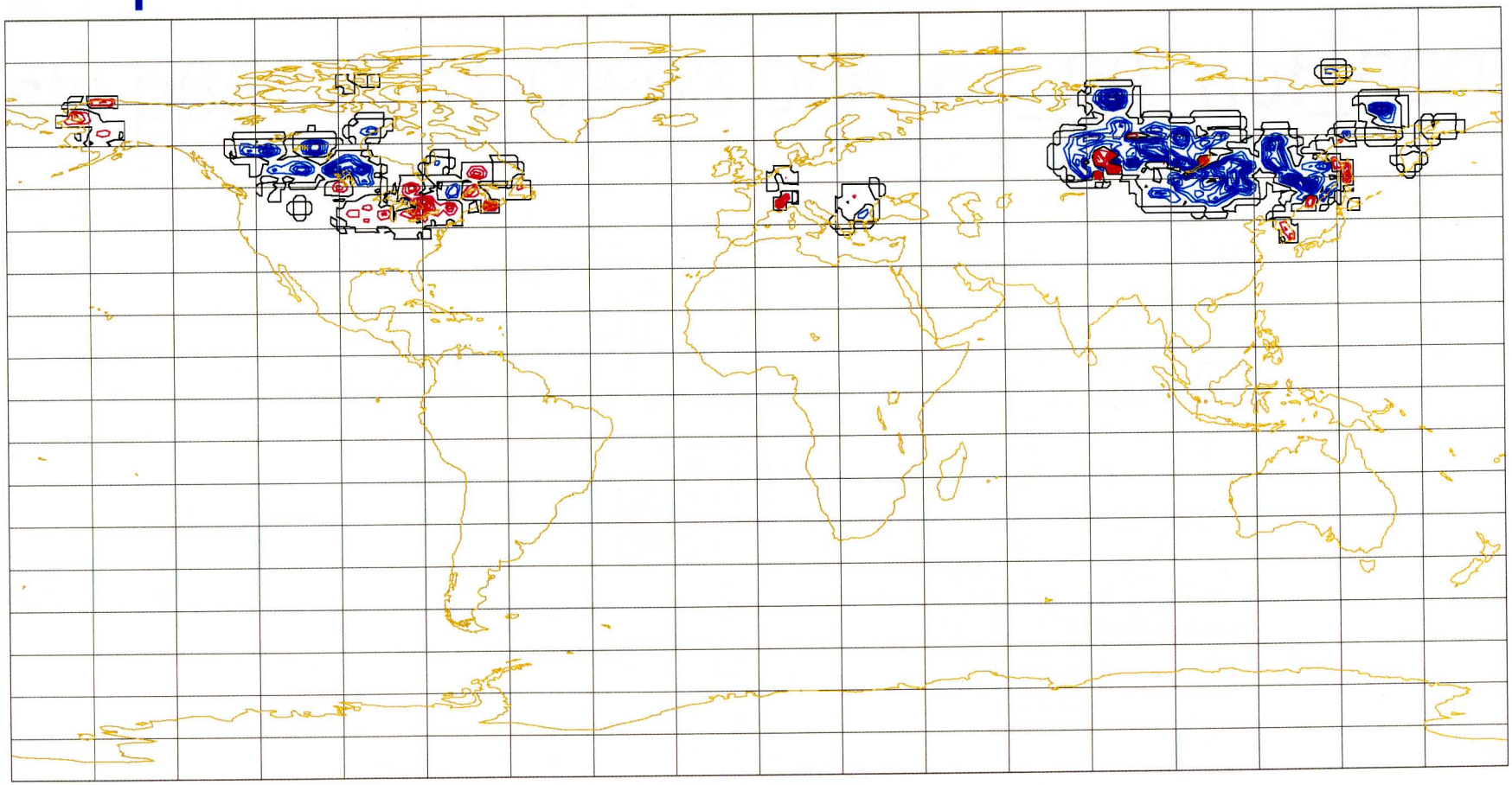
QUANTITE DE NEIGE

WAGONS REJETES : 52 (10.8%) plus 113 ELIMINES (23.5%) - LISTE NOIRE (0) :
0 ELIMINES et 0 REJETES (0.0%)

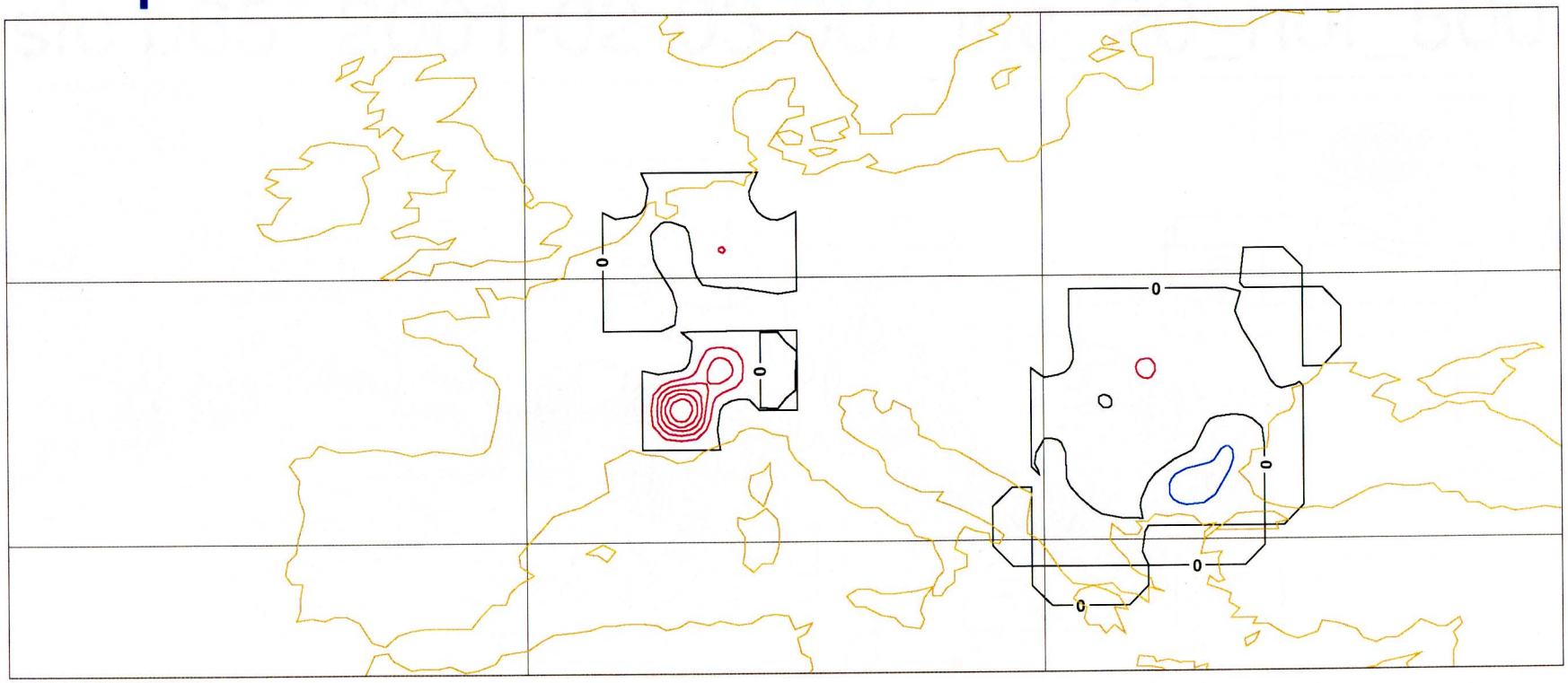
Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-17.441	SIGMA =	256.571 (04559)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.053	SIGMA =	0.156 (04819)
TEMPERATURE A 2M	OBS-MOD =	-0.697	SIGMA =	3.249 (05117)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.098	SIGMA =	2.465 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.689	SIGMA =	1.628 (03148)
QUANTITE DE NEIGE	OBS-MOD =	0.041	SIGMA =	38.839 (00480)
VENT U A 10M	OBS-MOD =	0.008	SIGMA =	2.703 (04937)
VENT V A 10M	OBS-MOD =	0.267	SIGMA =	2.584 (04937)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (03137)

sfc p65* 2001-02-03 00h inc_20_nof_500



sfc p65* 2001-02-03 00h inc_20_nof_500



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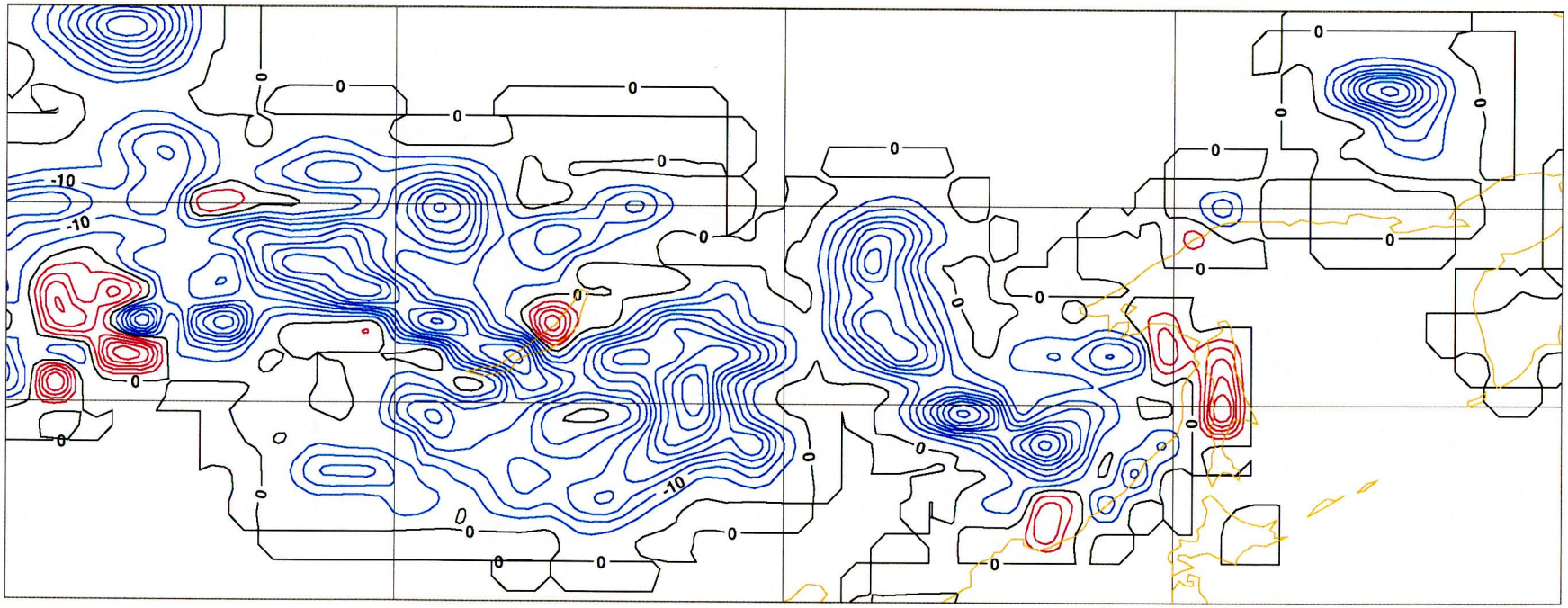
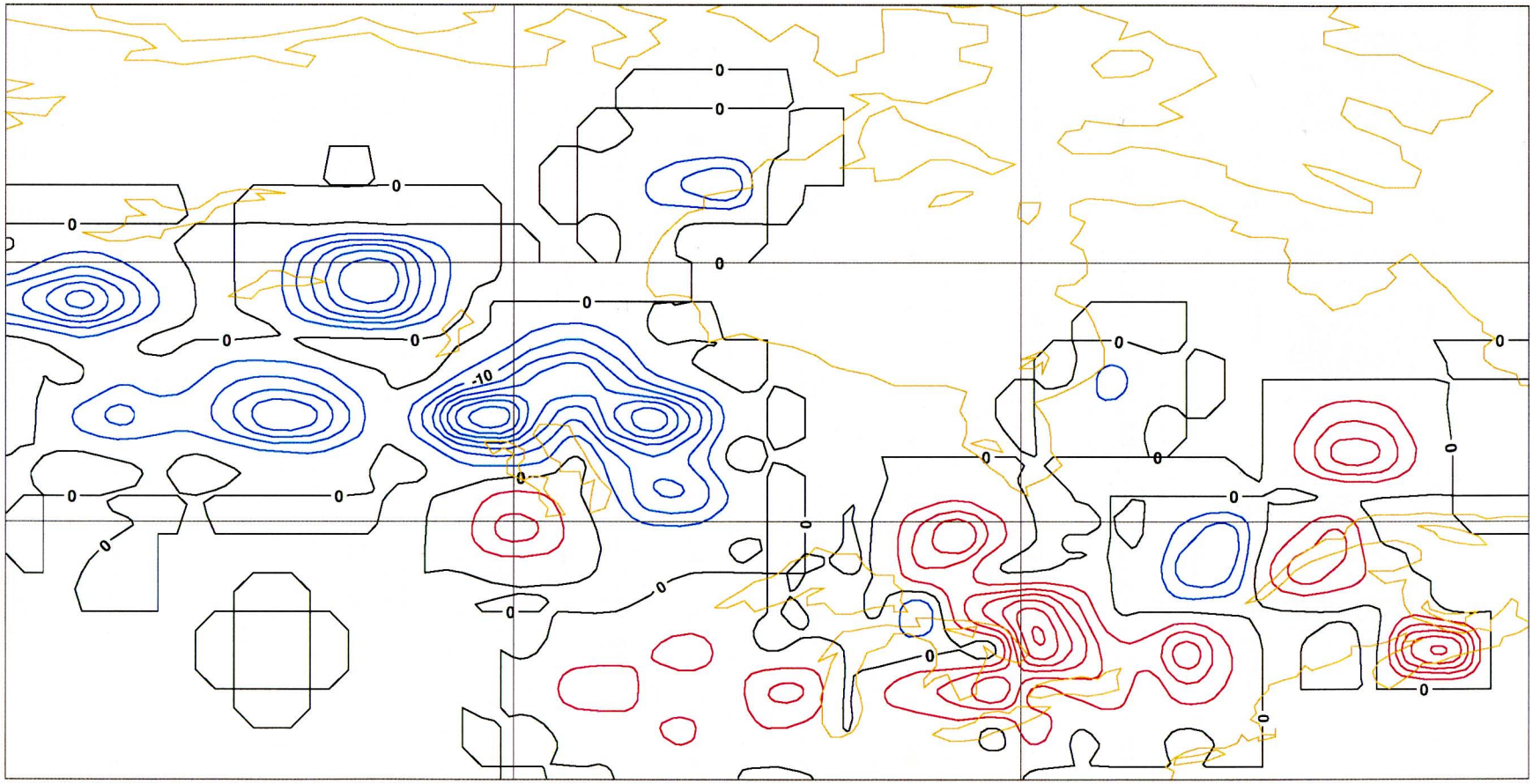


sfc p65* 2001-02-03 00h inc_20_nof_500



Before analysis

UANTITE DE NEIGE

WAGONS REJETES : 55 (14.0%) plus 201 ELIMINES (51.3%) - LISTE NOIRE (0) :
0 ELIMINES et 0 REJETES (0.0%)

Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-17.428	SIGMA =	259.070 (04187)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.049	SIGMA =	0.153 (04405)
TEMPERATURE A 2M	OBS-MOD =	-0.715	SIGMA =	3.175 (04677)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.115	SIGMA =	2.470 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.677	SIGMA =	1.577 (02797)
QUANTITE DE NEIGE	OBS-MOD =	-4.108	SIGMA =	44.055 (00392)
VENT U A 10M	OBS-MOD =	0.011	SIGMA =	2.720 (04514)
VENT V A 10M	OBS-MOD =	0.258	SIGMA =	2.612 (04514)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (02825)

Renseignements fournis par CAIDGU pour le champ SN GUESS sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1475E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.8

Renseignements fournis par CAIDGU pour le champ SN ANALYSE sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.1474E+03	0.1173E+04	0.0000E+00	46.60	2.58	0.1026E+05	67.26	325.8

Renseignements fournis par CAIDGU pour le champ SN TAILLE SL sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.9533E-01	0.6911E+00	0.0000E+00	46.60	2.58	0.1500E+02	54.74	79.01

Renseignements fournis par CAIDGU pour le champ SN RES ANA sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	-.8134E-01	0.1883E+01	-.4913E+02	50.31	115.26	0.3589E+02	49.46	143.06

Renseignements fournis par CAIDGU pour le champ SN SIGA/SIGP sur 126596 points

niv.	moyenne	ecart-type	minimum	lat.	lon.	maximum	lat.	lon
1	0.9917E+00	0.6226E-01	0.1439E+00	50.71	4.53	0.1000E+01	46.60	2.58

After analysis

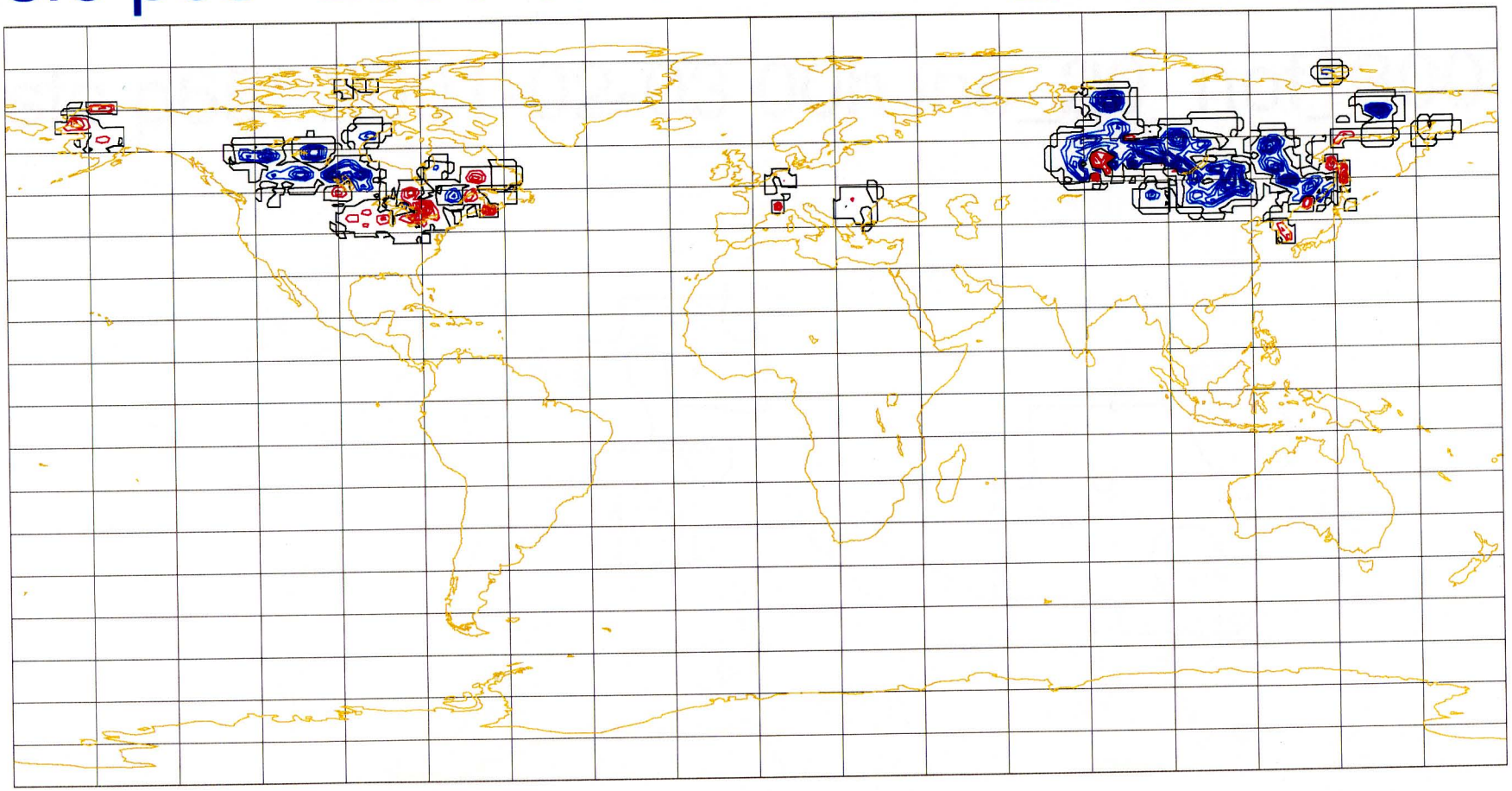
UANTITE DE NEIGE

WAGONS REJETES : 46 (11.7%) plus 201 ELIMINES (51.3%) - LISTE NOIRE (0) :
0 ELIMINES et 0 REJETES (0.0%)

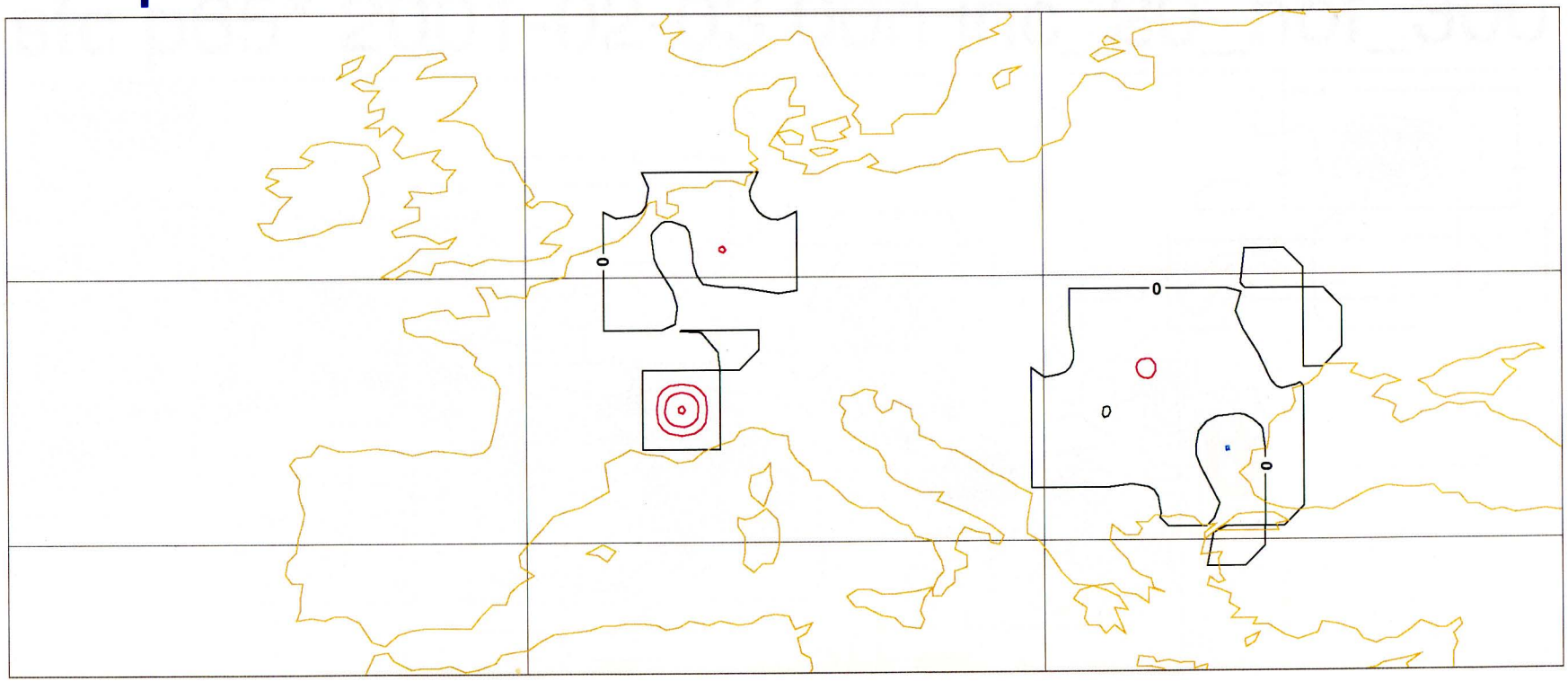
Type d'observations numero 1

GEOPOTENTIEL	OBS-MOD =	-17.428	SIGMA =	259.070 (04187)
HUMIDITE RELATIVE A 2M	OBS-MOD =	-0.049	SIGMA =	0.153 (04405)
TEMPERATURE A 2M	OBS-MOD =	-0.712	SIGMA =	3.173 (04677)
TEMPERATURE DE SURFACE	OBS-MOD =	-0.098	SIGMA =	2.465 (00535)
TAUX DE PRECIPITATIONS	OBS-MOD =	-0.677	SIGMA =	1.577 (02797)
QUANTITE DE NEIGE	OBS-MOD =	0.195	SIGMA =	39.806 (00392)
VENT U A 10M	OBS-MOD =	0.011	SIGMA =	2.720 (04514)
VENT V A 10M	OBS-MOD =	0.258	SIGMA =	2.612 (04514)
NON REPERTORIE	OBS-MOD =	0.000	SIGMA =	0.002 (02825)

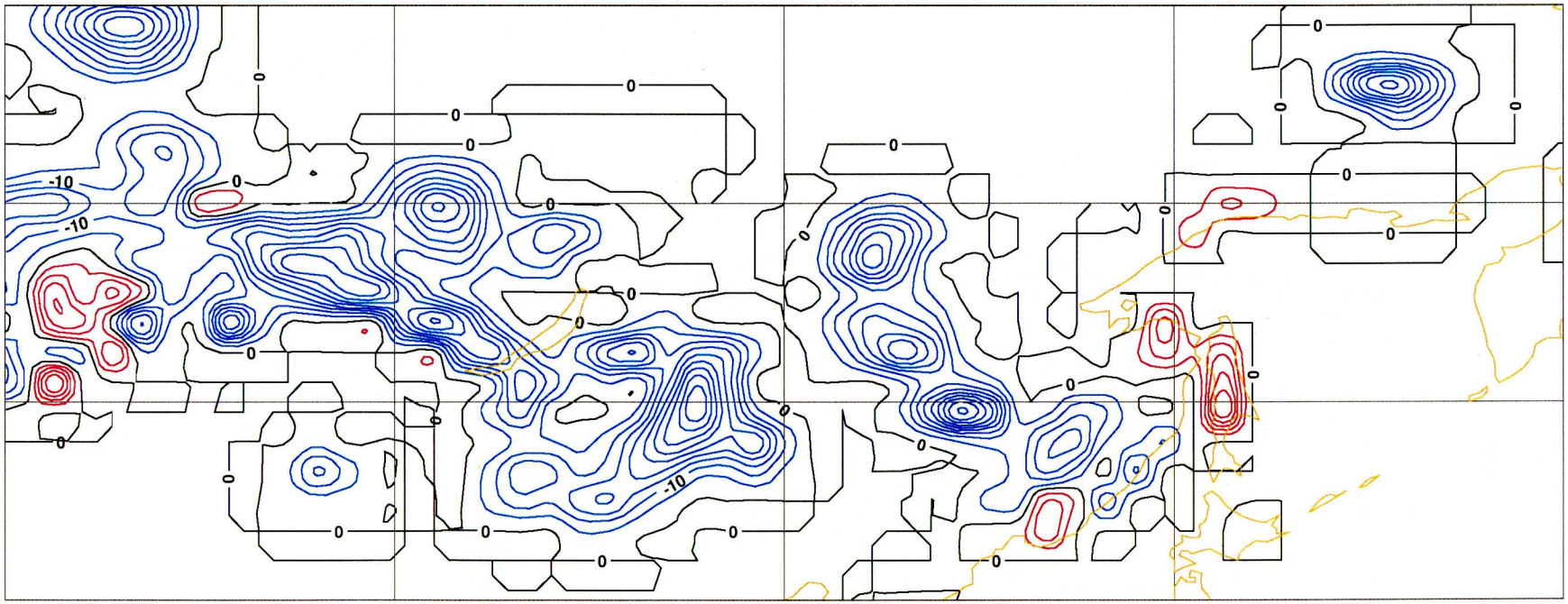
sfc p65* 2001-02-03 00h inc_20_nof_300



sfc p65* 2001-02-03 00h inc_20_nof_300



sfc p65* 2001-02-03 00h inc_20_nof_300



sfc p65* 2001-02-03 00h inc_20_nof_300