GRAPHIC DISPLAY OF MODEL OUTPUT BY USE OF MAGICS AND VIS-5D

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Abstract: Graphic software was introduced to chinese meteorological community when the first McIDAS was installed on the IBM 4331/2 at the Institute of Atmospheric Physics (IAP) in 1983. In pace with steady growth of computer systems both in IAP and NMC (National Meteorological Center) more graphic software packages were imported. MAGICS now becomes an important tool to provide the weather information to nation-wide users as well as to NMC forecasters. In 1993 a more sophisticated five dimension graphic software VIS-5D was installed in IAP and NMC on SGI workstation. The value of VIS-5D bas been proved in visualization of various numerical models.

I. INTRODUCTION

Introducing graphic software to support the weather forecast and meteorological research started in early 1980s when the first McIDAS (Man-computer Interactive Data Access System) was brought to China through the cooperation between the Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences and Space Sciences and Engineering Center (SSEC), University of Wisconsin. Three years later two sets of McIDAS system were set up at the National Meteorological Center (NMC) and Satellite Meteorological Center (SMC), China Meteorological Administration (CMA). The various graphics and images produced by McIDAS were disseminated to local weather services via TV broadcast as well as to NMC forecast division on video terminal for several years. McIDAS stepped down after the mainframe computer Hitachi M-170 was replaced by CDC Cyber-992 at NMC in late 1980s. The graphic software was switched from McIDAS to AMIGAS since then. In1990NMC got MAGICS from ECMWF. It is run on VAX system to support the operational forecast. In 1993 a 5-dimension graphic software VIS-5D was introduced to IAP for the purpose of supporting the numerical model development. It was also implemented on a SGI workstation at NMC through the cooperation between IAP and NMC. The utilization of VIS-5D is being studied.

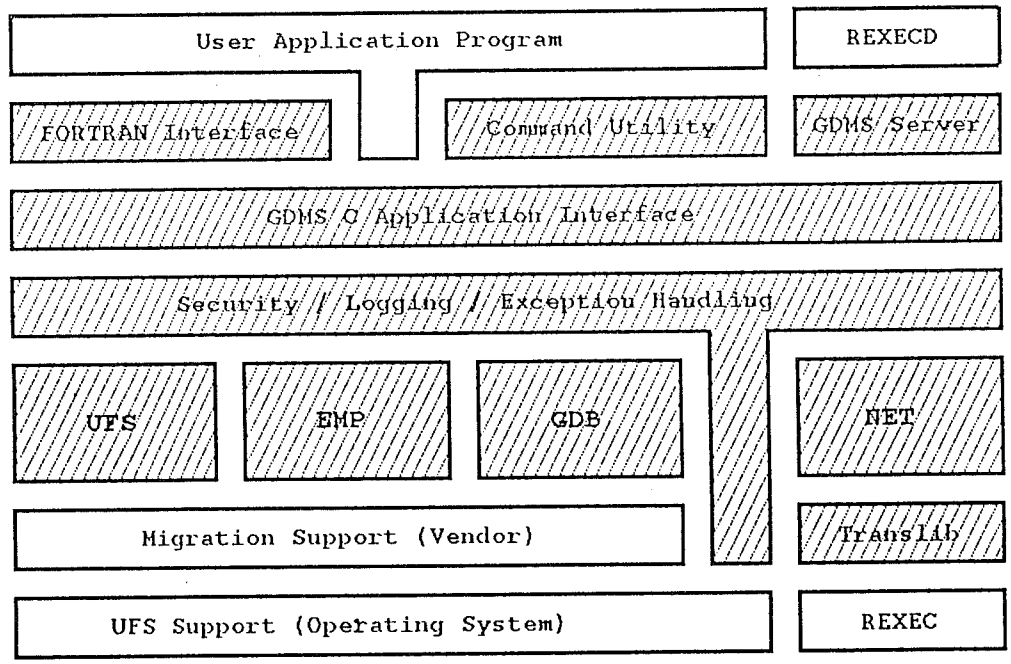


Fig.3 Architecture of client-server based GDMS package

Table 1: Performance - Local .vs. Network

	Local	Loopback	Client 1	Client 2
Insert	40	60	250	380
Retrive	30	40	400	450
Update	200	220	450	530
Delete	40	50	60	70

Note: 1. Time unit in ms/record

2. Record size: $240 \times 120 \times 8 = 230400$ Bytes

3. Local(CRAY2e), Client_1(HP755), Client_2(HP735)

three versions available to the users which run on Stardent GS-1000 or GS-2000, Silicon Graphics IRIS and IBM RS/6000 respectively. The SGI version of VIS-5D was kindly provided by Bill Hibbard to IAP in Spring 1993 and run on IRIS 4D/85GT workstation successfully. It is used to support the model development of the Laboratory of Atmospheric Science and Geofluid Dynamics (LASG) which is a national open laboratory. The output data from cloud model, meso-scale model, ocean model and climate model have been analyzed and displayed by VIS-5D for model verification and improvement. The functions of displaying vector slicing, iso-surface, contour slicing, color slicing, arbitrary vertical cross-section, trajectory etc. show that the VIS-5D is a powerful tool for the modelers. Figure 5 is a color print from ocean model. The ocean topography file is created for ocean model to replace the earth topography data which are used for atmospheric model.

Figure 5. Surface current and iso-surface from IAP ocean model

VIS-5D was implemented on IRIS 4D/310GTX at NMC in September 1993 with the help from IAP. The output from the operational numerical weather prediction model T42 was analyzed by VID-5D for case study. Figure 6 is a sample which showes the potential vorticity by use of iso-surface, horizontal contour slice to indicate the positive and negative vorticity centers. The complex topography in East Asia is evident. Since the SGI workstation is connected to the NMC network, the outputs from medium-range model, limited area model, heavy rainfall model, tropical cyclone model etc. will soon be analysed by VIS-5D for model verification.

Figure 6. Potential vorticities calculated by model T42

IV. CONCLUSIONS

The computer graphics play more and more important role in meteorological modernization. The international exchange and collaboration are critical in helping the developing countries on sharing the success of other countries. We sincerely thank the offers of MAGICS from ECMWF and VIS-5D by Bill Hibbard and study is being continued to find the potential abilities on use of imported graphic software.

II. MAGICS

MAGICS which is developed by ECMWF was installed on VAXstation 3100 in 1990 at NMC and updated later on. VAX 3100 is connected to other computers and peripherals by computer network as Figure 1.

Figure 1. Schematic diagram of computer network at NMC

After one year testing and interfacing to database MAGICS graphic products are now the important source of meteorological information to local weather services as well as to NMC forecasters. The data format of real-time database has beeen updated to GRIB and BUFR. The outputs from the operational short-range forcasting model B, medium-range model T42 and T63, and LAFS etc. provide 350 charts each day automatically and the warning message is displayed when the system has problem. The products from ECMWF model are also available to the users. There are three ways to display or distribute the MAGICS products: VAXstation video terminal and VAX graphic terminal, laser printer and nation-wide computer network. About 65 charts per day are selected and transmitted via network to regional and provincial weather services, hydrological services, universities and research institutions. The resolution of graphics are reduced due to the low communication rate (9600 baud) to remote users. Figure 2 showes the broadcast system structure. The user end terminal is based on personal computer. Figure 3 and 4 are the sample charts available to central and local users.

Figure 2. Connection between NMC and remote users

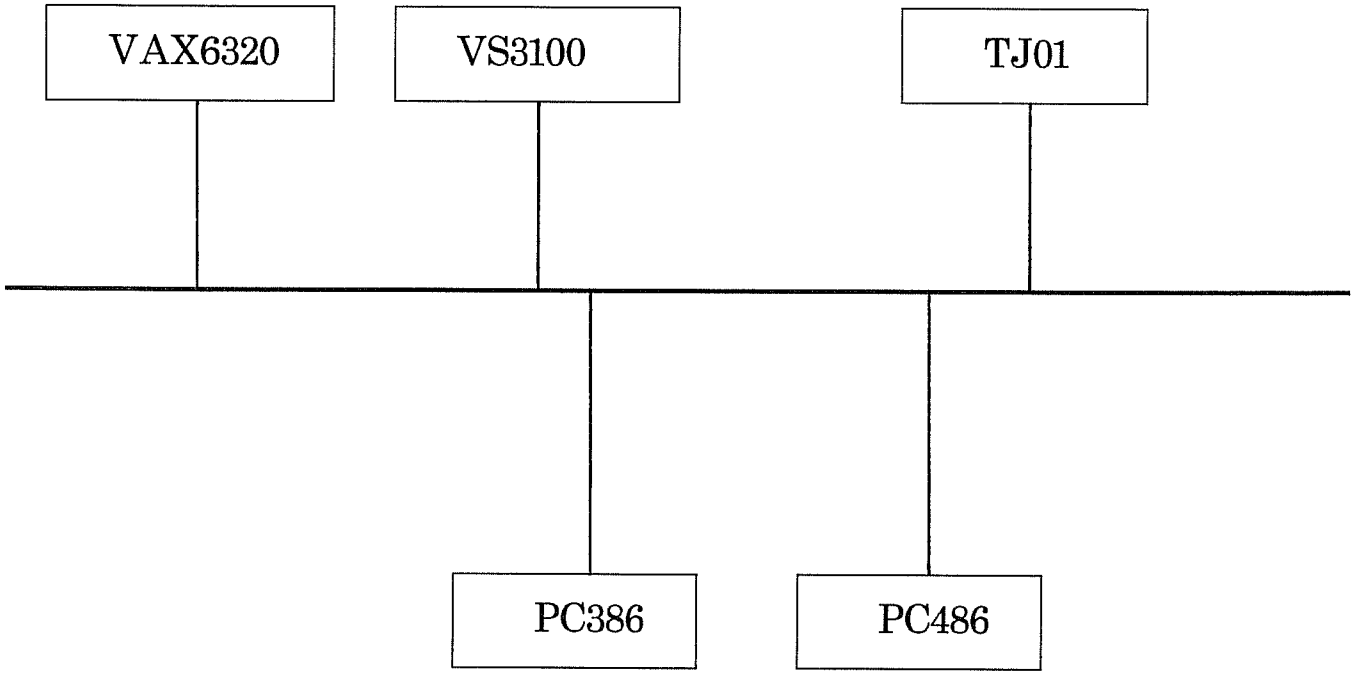
Figure 3. Geopotential Height at 500 hPa from T42

Figure 4. Reduced resolution EC product available to remote users

III. VIS-5D

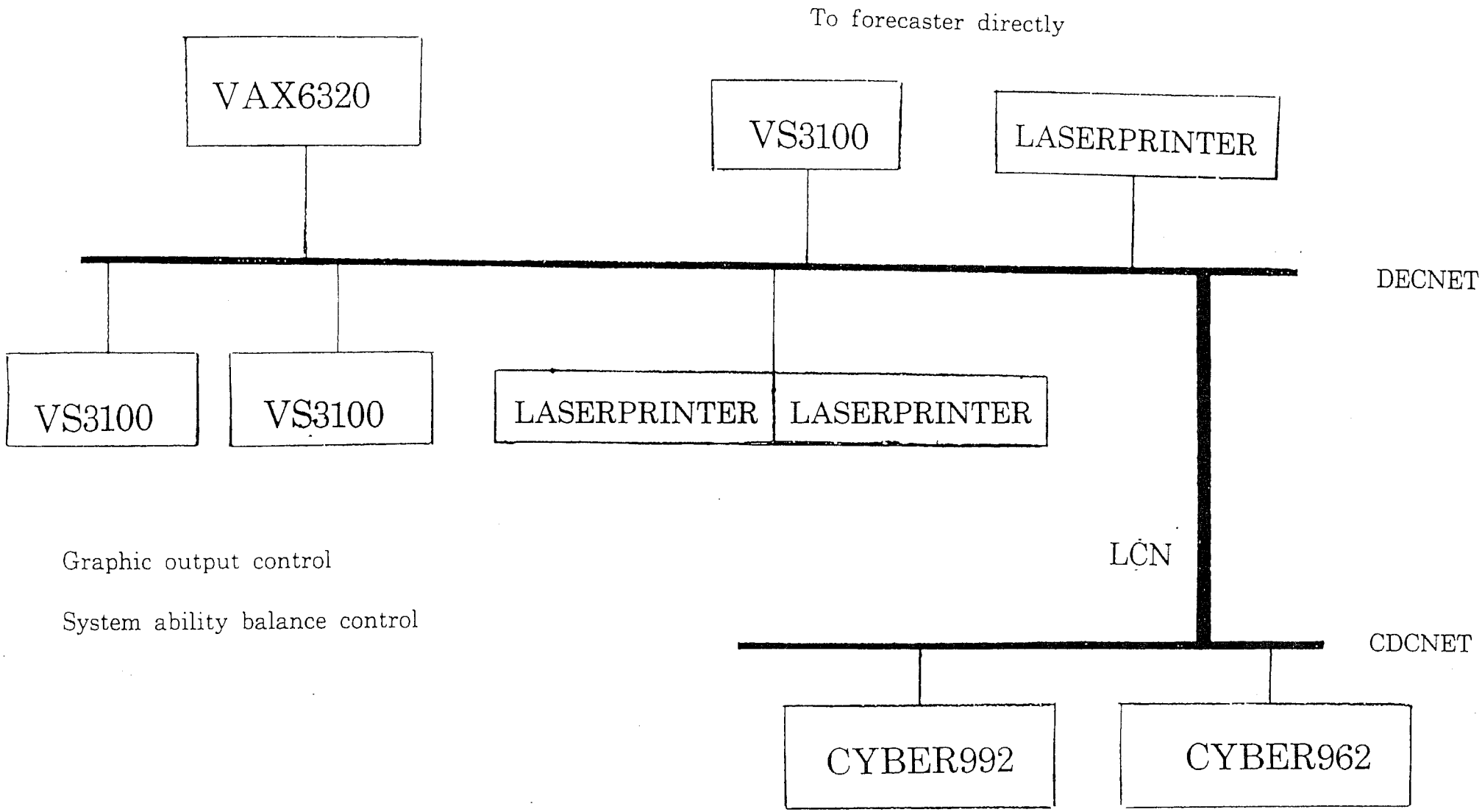
VIS-5D is a five dimension graphic software package specially designed for display of numerical model output. It is originated from McIDAS and now becomes a stand alone system. The main developer is W. Hibbard from University of Wisconsin. VIS-5D is a free software. There are

· Products distribute on network
· Broadcast



· Products Monitors

Figure 2. Connection between NMC and remote user



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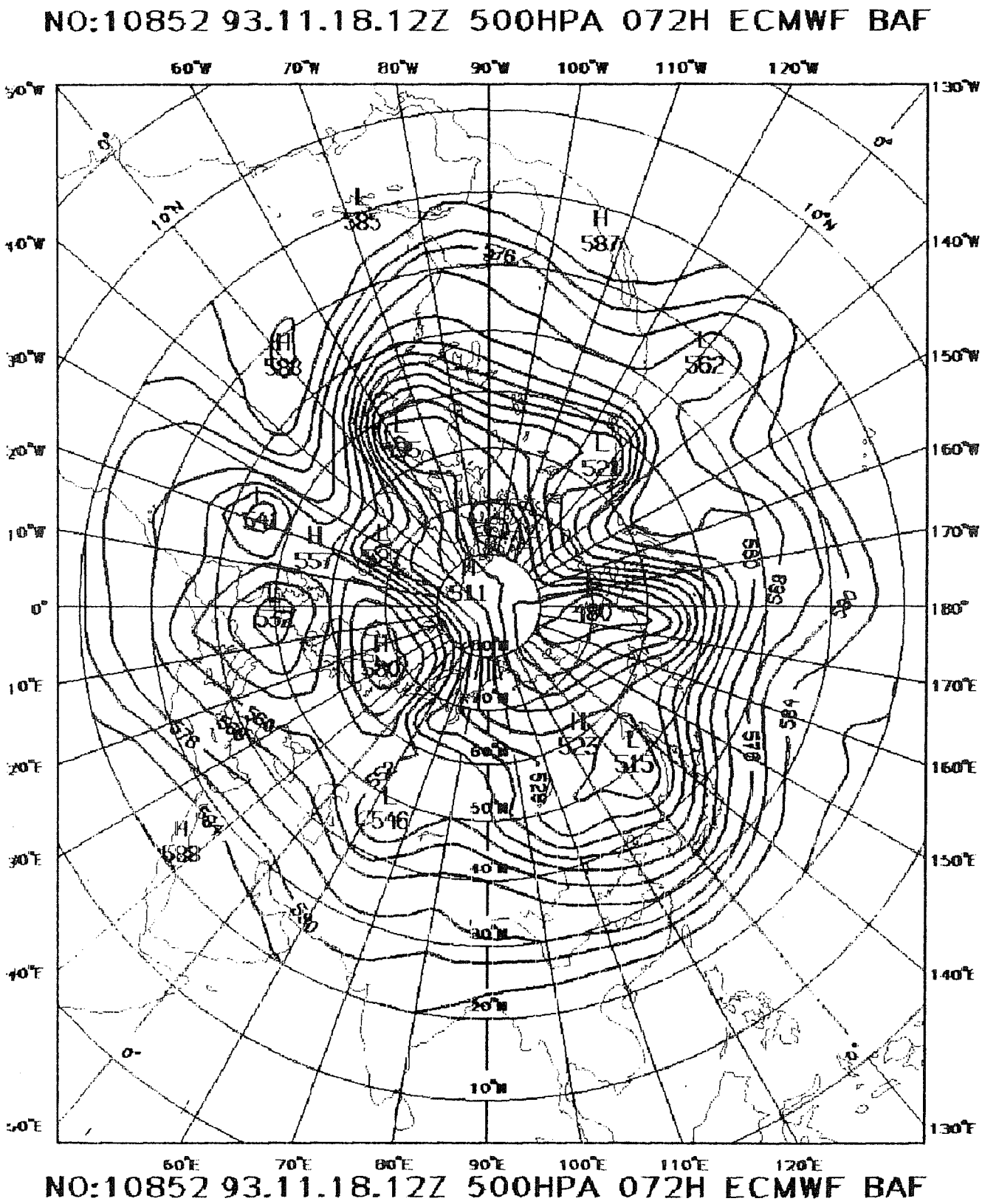
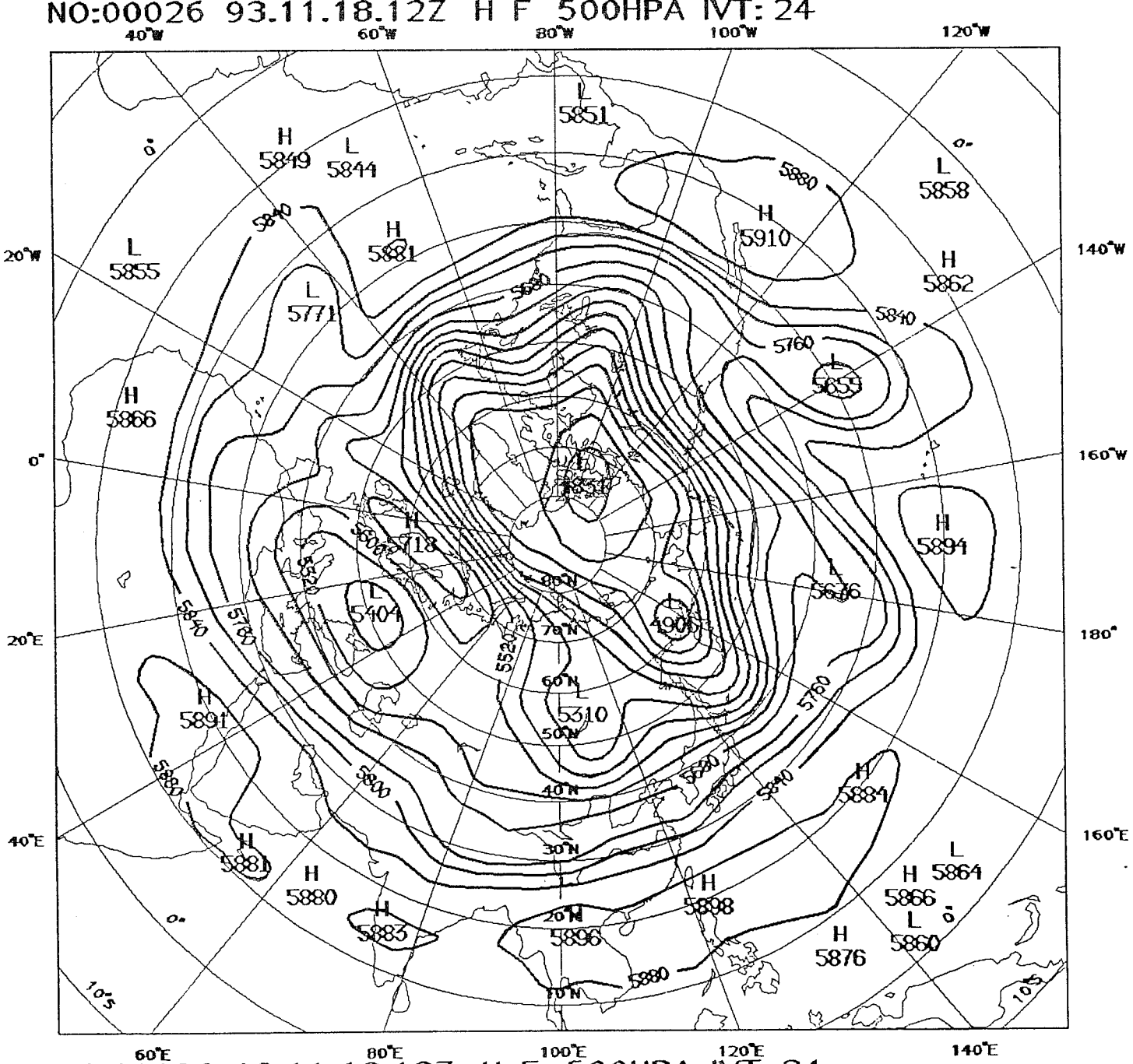


Figure 4. Reduced resolution EC product available to remote users



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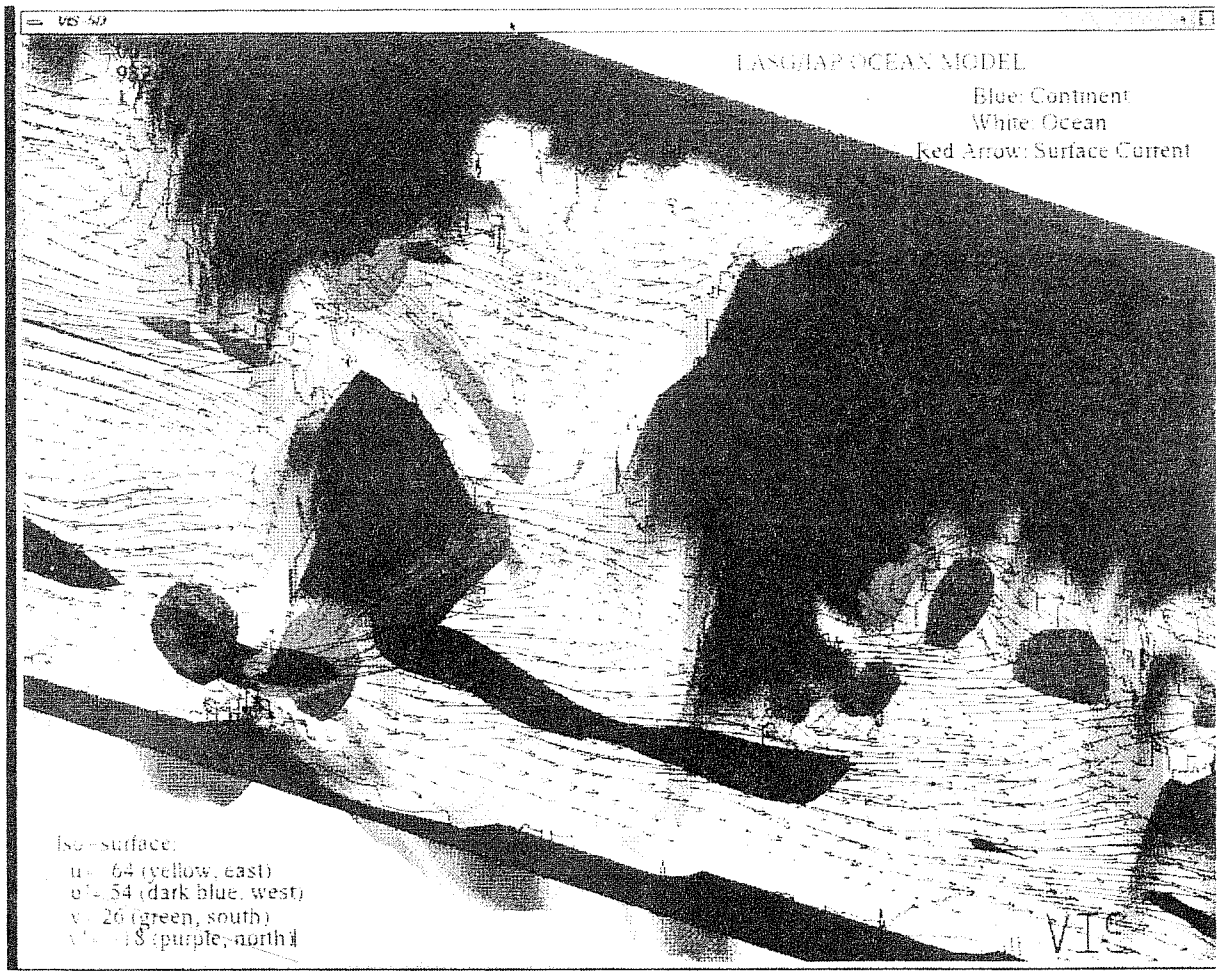

Figure 5. Surface current and iso-surface from IAP ocean model

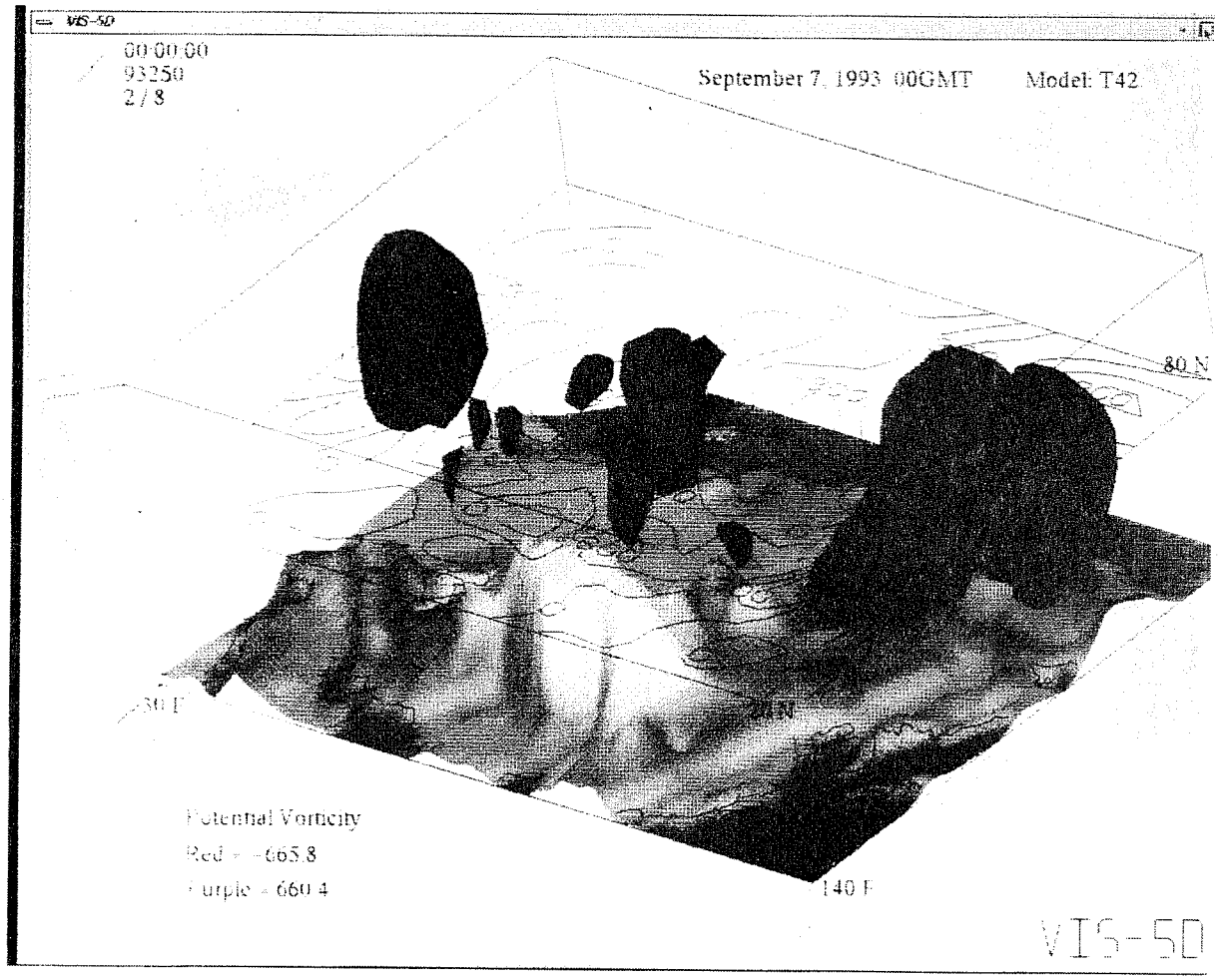

Figure 6. Potential vorticities calculated by model T42