



## The Italian ITASE Expedition from D85 to M4 (East Antarctica)

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### INTRODUCTION

As a part of ITASE project (International Trans-Antarctic Scientific Expedition; Mayewski & Goodwin, 1999), between November 2001 and January 2002, the Italian *Programma Nazionale di Ricerche in Antartide* made a traverse through Adélie, George V, Oates and northern Victoria Lands (Fig. 1, Tab. 1).

The study aimed to better understand latitudinal and longitudinal gradients along one East-West (D66 - Talos Dome) and two North-South (D85 - D59 and GV7 - Talos Dome - M4) transects, while documenting climatic, atmospheric and surface conditions during the last 200-1000 years in the eastern and north-eastern portions of the Dome C drainage area and in northern Victoria Land.

During the 1998/1999 season members of the Italian Antarctic programme made the first traverse from Terra Nova Bay to Dome C (Frezza & Flora, 2002). The traverse in the eastern Dome C drainage area took place between 20 November 1998 and 16 January 1999, and covered about 1300 km. The traverse team consisted of eight people: three mechanics and five scientists (four Italians and a French guest).

During the 2000/2001 season 69 tons of supplies (fuel, food, snow box, etc.) for the 2001/2002 ITASE campaign were delivered from Cape Prud'homme on the forward legs of the transport traverses (IPEV-PNRA) between Dumont d'Urville and Dome C; the ITASE vehicles were delivered from Dome C to D85 on the return legs of the IPEV-PNRA traverses (Patrice Godon officer in charge of the traverse, personal communication).

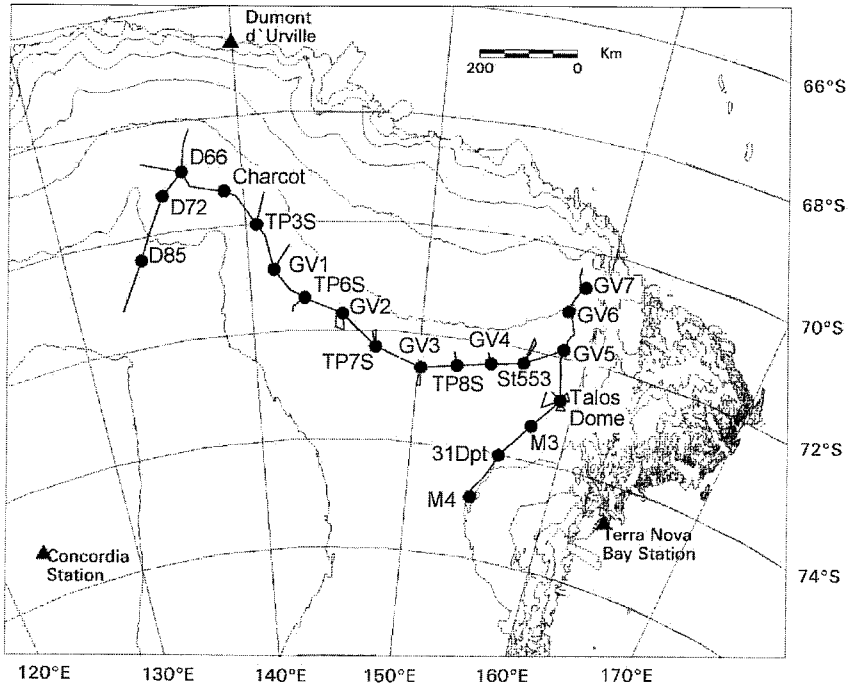


Fig. 1 – Schematic map showing the traverse routes, firm core locations and snow radar survey.

### 2001/2002 TRAVERSE

The traverse party arrived on 3 November 2001 at D85 by Twin Otter from Terra Nova Bay Station (Fig. 1). From 3-14 November 2001 the party prepared the vehicles and modules for the traverse. Climatic conditions were very severe during this period, and temperatures dropped below  $-50^{\circ}\text{C}$ . The traverse started out from D85 on 15 November 2001 and arrived at M4 on 16 January 2002, after having covered about 1875 km (Fig.1, Tab. 1). The traverse team consisted of eight people: three mechanics, four scientists (three Italians and a French guest) and a doctor. The traverse route and borehole sites were selected and surveyed in Italy based on the analysis of georeferenced satellite imagery (Landsat ETM<sup>+</sup>, ERS-1 SAR, AVHRR) and of a Digital Terrain Model provided by Rémy et al. (1999). The traverse vehicles consisted of eight articulated sledges (4 modules: sleeping-living, generator-workshop, drilling-core storage, storage; 4 fuel sledges) pulled by two Pisten Bully 330 Kassbohrers, and two Caterpillar Challengers 55C. The beginning of traverse was marked by breakdown of: Onan power generator's electronic board, PB330 high-pressure tube, sledges of tanks, sledges of drill and storage modules. Due to these inconveniences, the convoy was stopped for a total of 7 days. The electronic board and sledges were repaired with the invaluable assistance of Terra Nova Bay Station (we thank A. Della Rovere, L. Sartori and M. Zangirolami).

Eighteen shallow snow-firm cores up to 55 m deep were drilled (Tab. 2), for a total of 655 m and 4300 kg. An electromechanical drilling system (100 mm in diameter) was used. Firm temperatures were measured on site using ten "Pt 100 ohm at  $0^{\circ}\text{C}$ " probes after a 15-24 hour stabilization, at different depths (1, 3, 5, 7, 10, 13, 15, 20, 25 and 30 m) for boreholes deeper

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Tab. 1 – 2001/02 traverse route.

<i>Longitude East</i>	<i>Latitude South</i>
134°08.625'	70°25.656'
135°27.211'	69°34.977'
136°56.112'	68°56.378'
137°15.013'	69°12.201'
139°00.883'	69°22.483'
139°40.871'	69°32.079'
140°34.539'	70°01.747'
141°04.50'	70°23.254'
141°23.00'	70°52.266'
141°59.650'	71°08.959'
143°04.92'	71°24.502'
144°05.186'	71°32.060'
145°15.786'	71°42.702'
146°12.247'	71°59.722'
147°17.244'	72°18.114'
148°29.421'	72°26.613'
150°10.433'	72°37.7'
151°10.359'	72°34.932'
152°21.430'	72°31.252'
153°15.346'	72°28.361'
154°29.049'	72°23.317'
155°21.047'	72°20.409'
156°22.093'	72°16.675'
157°32.761'	72°04.474'
158°32.216'	71°53.22'
158°51.749'	70°41.052'
159°04.545'	72°46.235'
158°29.938'	73°03.263'
157°39.699'	73°22.916'
156°48.292'	73°42.451'
155°57.6'	74°01.52'
155°17.99'	74°26.935'

Tab. 2 – Location and depth of cores drilled during 2001/2002.

<i>Site</i>	<i>Longitude East</i>	<i>Latitude South</i>	<i>Depth (m)</i>
D76	135°27.211'	69°34.977'	33.5
D66	136°56.112'	68°56.378'	49.4
Charcot	139°00.883'	69°22.483'	24.8
TP3S	140°34.539'	70°01.747'	24.9
GV1	141°23.00'	70°52.266'	48.9
TP6S	143°04.92'	71°24.502'	25.5
GV2	145°15.786'	71°42.702'	55.5
TP7S	147°17.244'	72°18.114'	30.5
GV3	150°10.433'	72°37.7'	50.1
TP8S	152°21.430'	72°31.252'	25.4
GV4	154°29.049'	72°23.317'	44.6
St553	156°22.093'	72°16.675'	25.0
GV5	158°32.216'	71°53.22'	48.0
GV6	158°16.975'	71°10.622'	25.2
GV7	158°51.749'	70°41.052'	55.1
TDN	159°04.545'	72°46.235'	53.6
M3	157°39.699'	73°22.916'	25.6
M4	155°17.99'	74°26.935'	24.6

than 30 m, and at the bottom of 25 m boreholes. The boreholes were carefully sealed with a foam rubber stopper to prevent air from flowing down the hole. The snow/firn density was determined immediately after retrieval by measuring and weighing core sections. Cores were packed in plastic bags and stored in insulated boxes before being transported by Twin Otter to a freezer at Terra Nova Station, from where they were later shipped to Italy and France.

Eight snow-pits up to two metres deep were also dug to investigate snow stratigraphy and density, and for chemical and isotopic analysis (D66, GV1, GV2, GV3, GV5, GV7 and TDN). One-metre samples were drilled every 5 km of

traverse (363 samples) for chemical-isotopic analysis. At eight sites (D66, GV1, GV2, GV3, GV5, GV7 and TDN) stake farms (30–40 stakes) were installed and measured using a GPS in order to study submergence velocities and the variability of snow accumulation. During the 1996 expedition 66 accumulation stakes were set up at intervals of 5 km at Talos Dome and between this site and 31Dpt (Frezzotti et al., 1998). At Talos Dome, 9 stakes were geometrically positioned about 5 km apart in an octagonal array 8 km from the borehole (TD core). The height of 30 of the 66 stakes along the traverse was re-measured to determine snow accumulation rates, and the 9 stakes at Talos Dome were re-measured to calculate ice velocities using GPS. In 30 sites at interval of about 40 km, stakes for ice velocity measurements were installed and positioned using a GPS. Snow radar (GPR) and GPS surveys were performed over a distance of 3245 km in order to link core sites, and to provide detailed information on the spatial variability of snow accumulation and a detailed description of the topographic culmination in the Talos Dome area (Frezzotti et al., this volume). Along the traverse, 340 gravity and magnetic measurements were acquired to outline the structural setting and crustal structure of the Wilkes

Subglacial Basin and to better understand the nature of the basement. Magnetic and gravity measurements were performed approximately every 5 km. LaCoste & Romberg gravimeters were used to acquire data, and the profiles at 9 stations were tied to the absolute gravity station in Terra Nova Bay. A vertical gradiometer, consisting of two Cesium magnetometers mounted on a pole, was used to acquire magnetic data. Remote sensing ground truth was collected through a survey of the spatial distribution of the type, size and orientation of microrelief. A FieldSpec FR spectroradiometer (provided by R. Casacchia, CNR) was used to acquire VIS-IR spectrometry data at selected sites. There were no accidents or injuries during the traverse.

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