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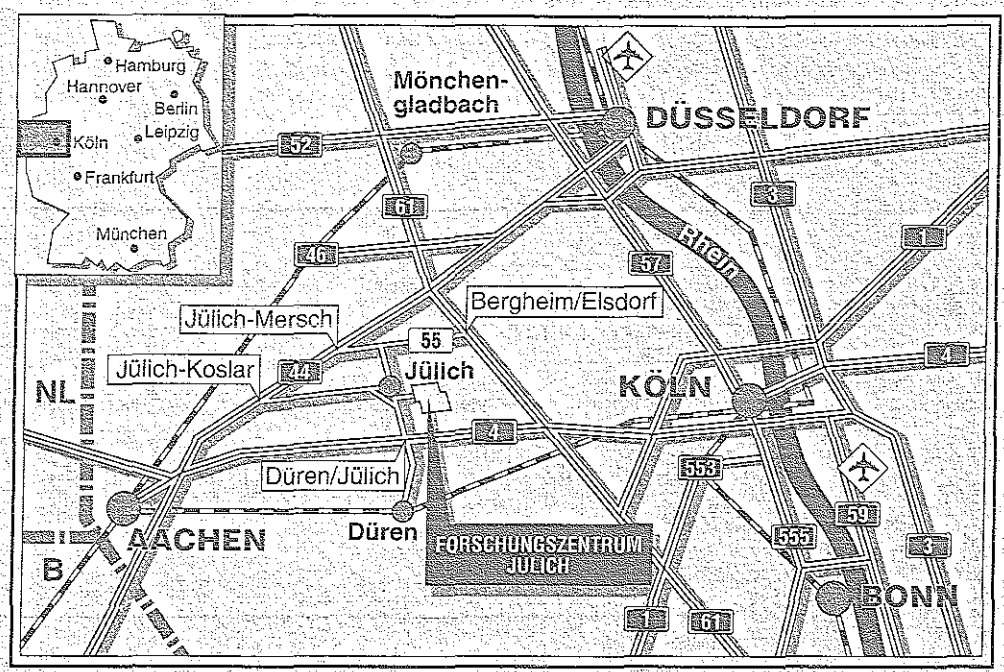
Institut für Chemie und Dynamik der Geosphäre 2:
Chemie der Belasteten Atmosphäre

Ozone Profiles at Jülich, Germany during 1993/1994 and at Santa Cruz de Tenerife, Spain in August 1993

H.G.J. Smit W. Sträter D. Kley E. Cuevas



Berichte des Forschungszentrums Jülich ; 3078
ISSN 0944-2952
Institut für Chemie und Dynamik der Geosphäre 2:
Chemie der Belasteten Atmosphäre Jül-3078

Zu beziehen durch: Forschungszentrum Jülich GmbH · Zentralbibliothek
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Ozone Profiles at Jülich, Germany during 1993/1994 and at Santa Cruz de Tenerife, Spain in August 1993

H.G.J. Smit[1] W. Sträter[1] D. Kley[1] E. Cuevas[2]

[1] Forschungszentrum Jülich GmbH
Institut für Chemie und Dynamik der Geosphäre 2: Chemie der Belasteten Atmosphäre
[2] Institutio Nacional de Meteorologia
Observatorio Especial de Izana, 38071 Santa Cruz de Tenerife, Spain

Table of contents

Summary

This sixth report of a series of ozone profiles contains the individual measured vertical profiles of ozone and the meteorological parameters like pressure, temperature and relative humidity obtained from incidental soundings made at Jülich, Germany (50° 41' N, 6° 24' E) during 1993 and 1994. The report also includes vertical profiles measured at Santa Cruz de Tenerife, Canary Islands, Spain (28° 18' N, 16° 30' W) during an intensive field campaign in August 1993.

TOR

Tropospheric Ozone Research

1. Introduction

Tropospheric ozone plays a crucial role in tropospheric chemistry as a precursor for reactive radicals. As a significant absorber of infrared radiation it contributes to the greenhouse effect. Ozone is a toxic gas and especially at higher concentrations it will give damage to human-, animal- and plant life. Already at low concentrations it reduces the photochemical activity of green plants. Ozone is thought to play an important role in the syndrom of forest damage.

Measurements of ozone from the last century up to now show that its concentrations near the ground as well as in the free troposphere are increasing at a rate of approximately 1 % per year [Attmanspacher (1984), Feister (1987), Volz (1988)].

The chemistry, transport and budget of tropospheric ozone and other photooxidants is investigated as a major component of the EUROTRAC project TOR (Tropospheric Ozone Research).

Within TOR, a network of stations in Europe performs regular vertical soundings of ozone and meteorological parameters (pressure, temperature and relative humidity) to investigate the seasonal effects in the role of stratosphere/troposphere exchange and transport from the atmospheric boundary layer into the free troposphere. Particularly the relation of ozone and the simultaneously measured water vapor enables us to investigate the influences of both transport and chemistry on the tropospheric ozone budget [Smit et al. (1993)].

The sounding program at Jülich started in July 1988 with incidental flights, while regular flights with a frequency of one per week were started in July 1989. The results up to December 1989 were reported in the first volume of these series [Smit et al. (1989)]. In January 1990 the frequency of soundings was extended to two flights per week and was continued until the end of 1992. In the second volume in these series the results obtained at Jülich during 1990, as well as the results of incidental soundings performed at the Schauinsland (Black Forest, Germany) mainly during an intensive field campaign in August

1990, were reported [Smit et al. (1991-A)]. The third volume reports the results of individual flights made at different latitudes over the Central Atlantic Ocean during two scientific cruises aboard the research vessel "Polarstern" in March/April 1987 and September/October 1988 respectively [Smit et al. (1991-B)]. The fourth and fifth volume reports the results of individual soundings made at Jülich during 1991 and at Jülich and the Schauinsland during 1992 respectively [Smit et al. (1994-C and 1994-D)].

In January 1993 the regular sounding program at Jülich have been stopped and since then only incidentally ozone soundings were made as participation in intensive, dedicated sounding campaigns. In this report, the sixth volume, we present the results of individual flights incidentally made at Jülich during 1993 and 1994, as well as the results of incidental soundings performed in collaboration with the Instituto Nacional de Meteorologia (INM) at Santa Cruz (Tenerife, Canary Islands, Spain) during an intensive field campaign in August 1993.

The ozone sounding system, instrumental set up and data processing, used at the sounding station at Jülich has been described in the first volume of these series [Smit et al. (1989)]. A detailed desription of the TOR ozone sounding station at Jülich has been reported by Smit et al. (1994-A). A brief description of the ozone sounding program at Santa Cruz is reported by Cuevas et al. [1993]

2. Vertical ozone profiles

The results of the soundings performed during 1993 and 1994 are presented in the form of individual vertical profiles of ozone and the simultaneously measured meteorological parameters like pressure, temperature and relative humidity. For every flight two plots are presented. The first plot shows the complete profile during ascent up to the burst altitude of the balloon. This plot gives a standard ozonagram with the partial pressure of ozone (mPa), temperature (^{o}C) and relative humidity (%) on the abscissa as a function of pressure (hPa) on

a logaritmic scale. The second plot presents the tropospheric part of the individual soundings in greater detail. Here, we use units of mixing ratio (ppbv) for ozone on the abscissa as a function of geometric altitude (km) where the altitude was computed step by step as the cumulative sum of the height difference between two successive pressure levels using the hydrostatic equation.

Acknowledgement

This work was supported as part of the EUROTRAC subproject TOR by the Bundesminister für Forschung und Technologie.

The authors wish to thank Mrs. C. Fries and Mr. B. Hermanns for assistance during the preparation and launches of the ozone sondes at Jülich and Mr. W. Petrick for modification of the radiosondes. Also we wish to thank Mrs. M. Carretero for the preparation of the ozone sondes and assistance during the launches at Santa Cruz de Tenerife.

3. References

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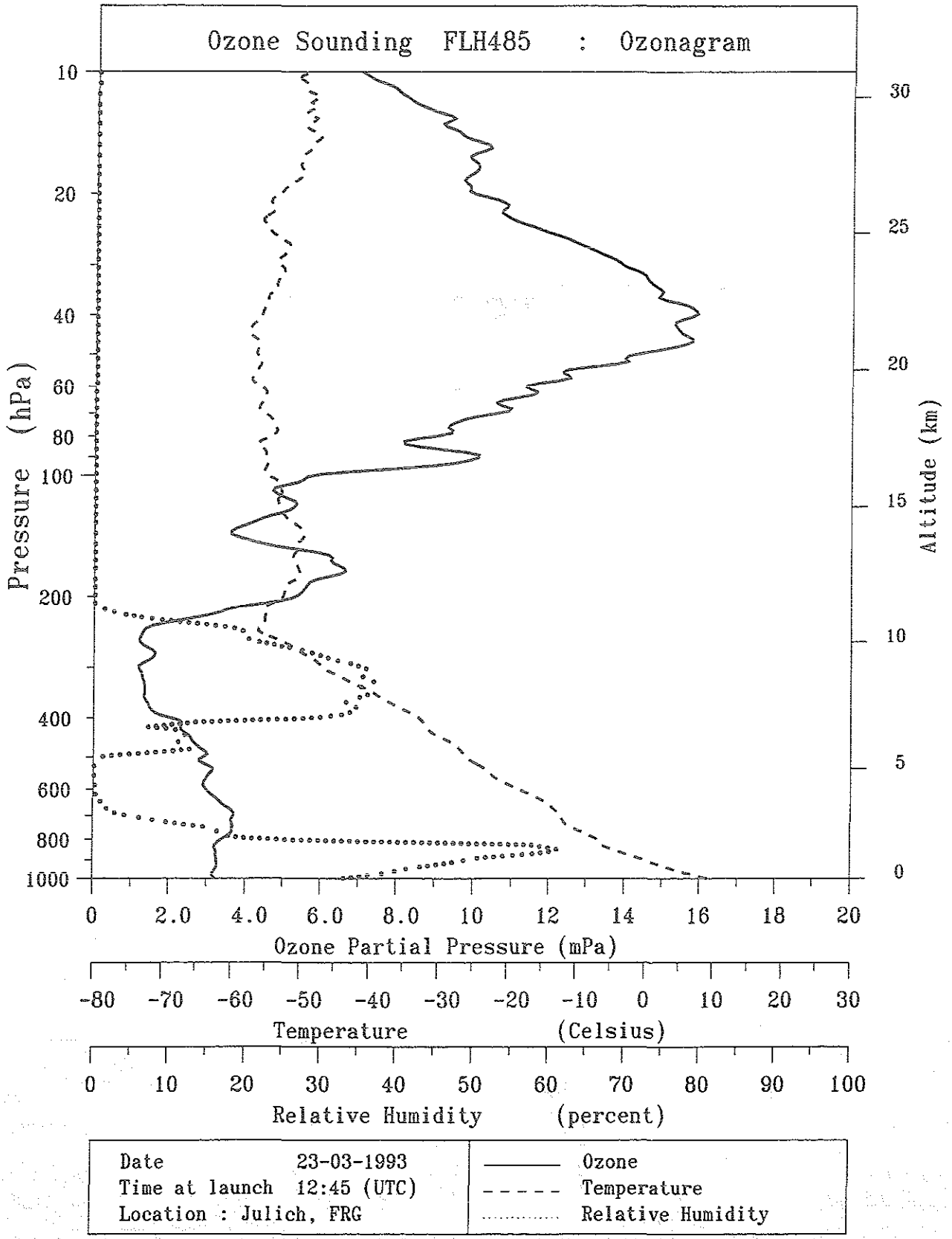
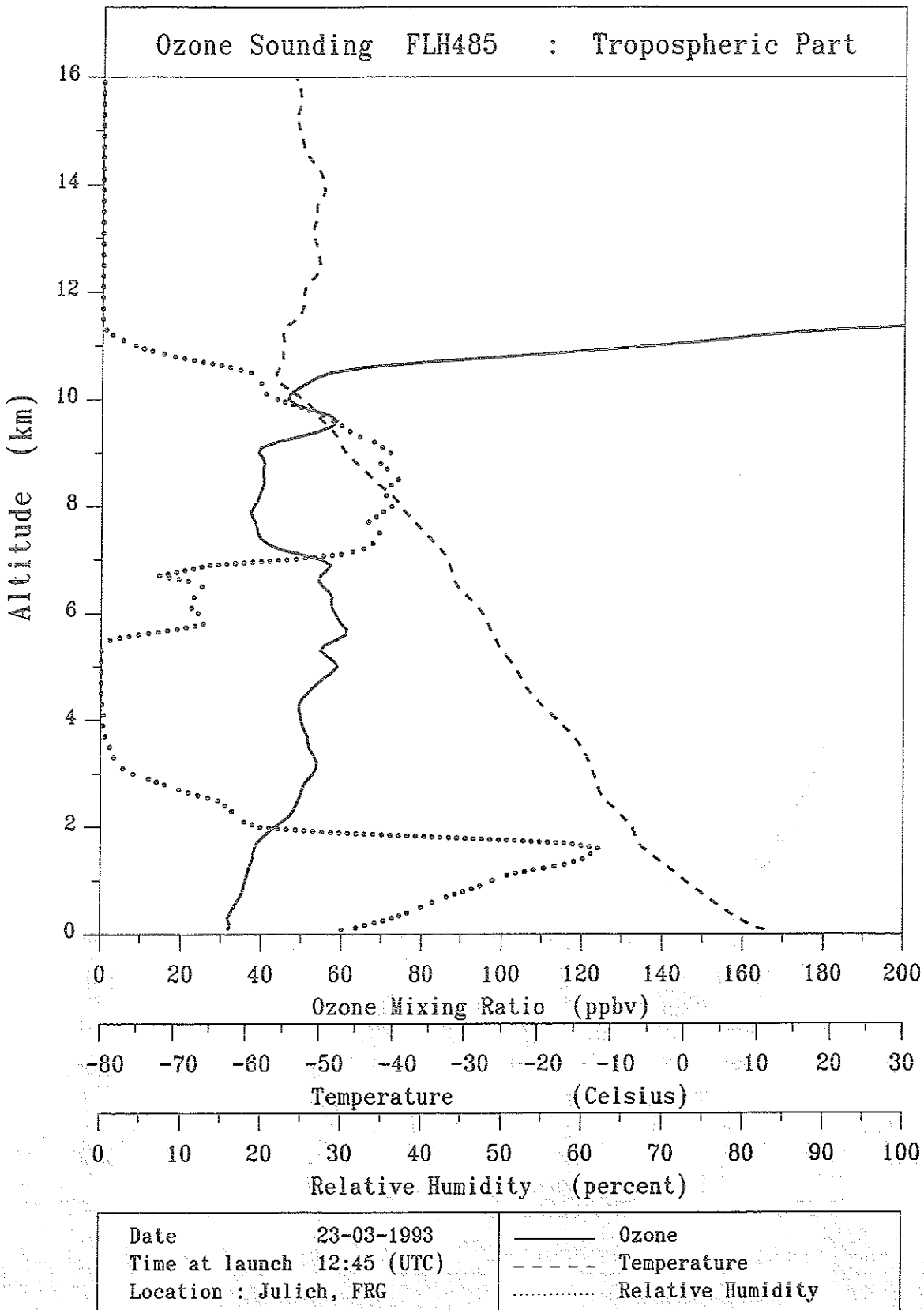
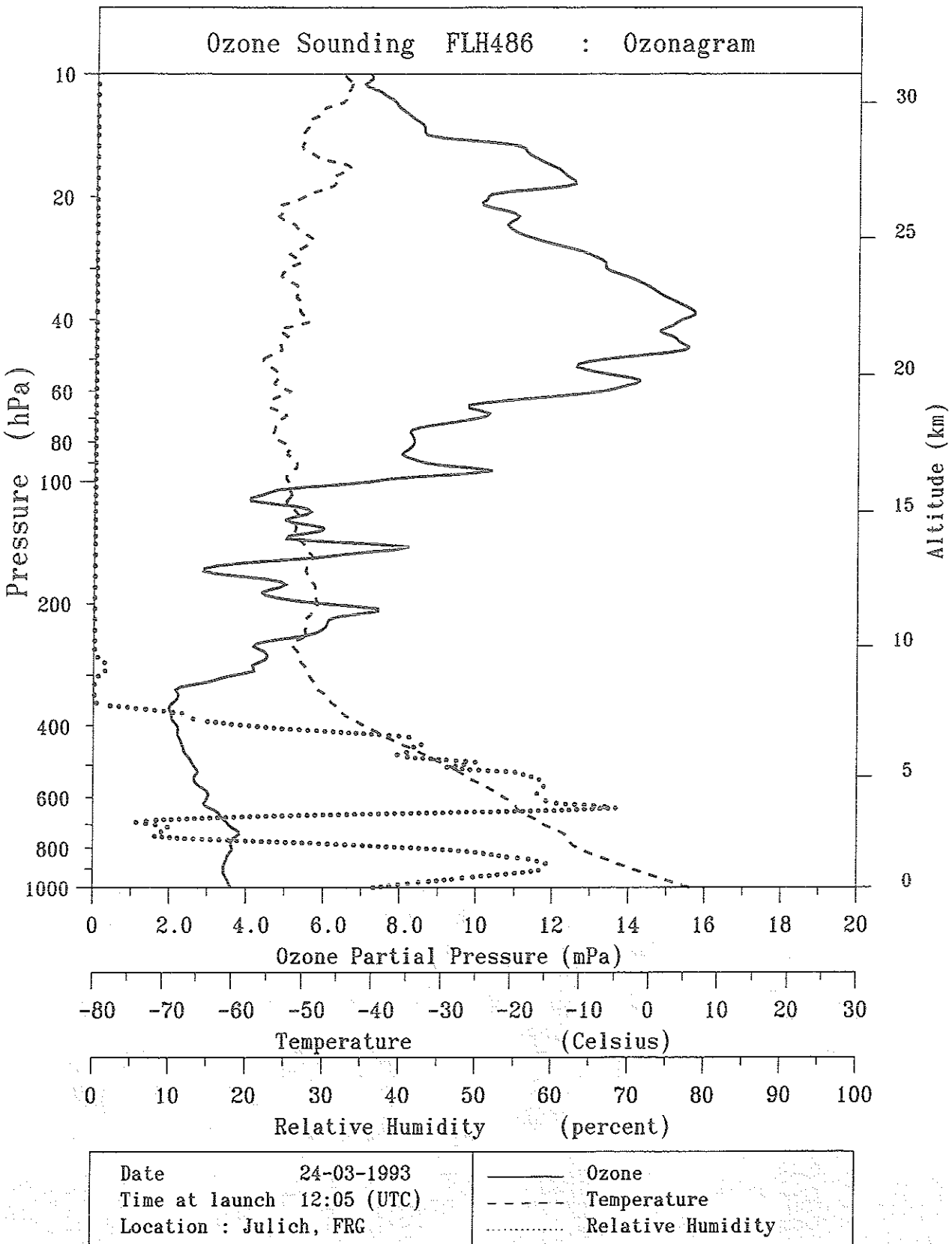
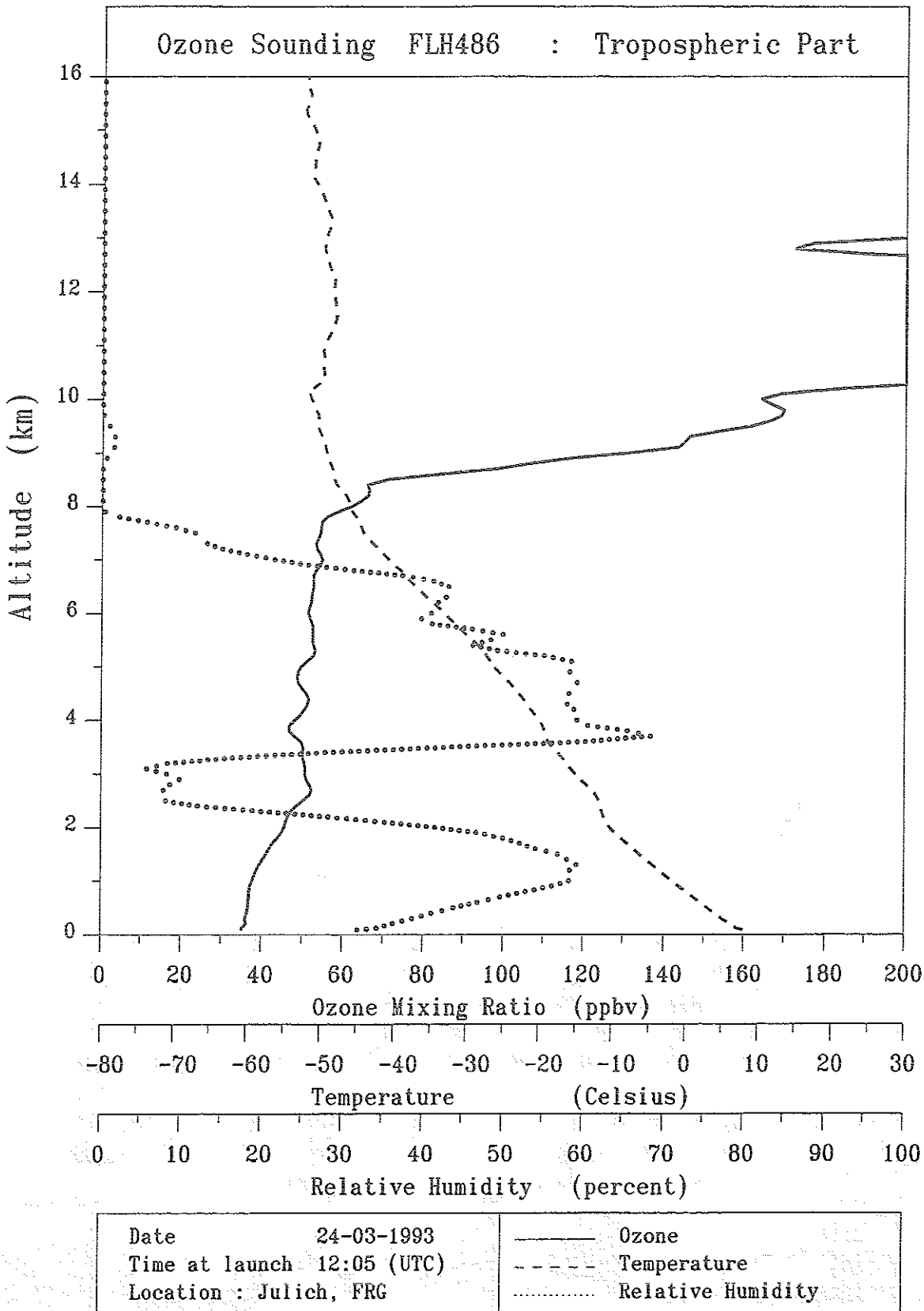
2. Vertical ozone profiles

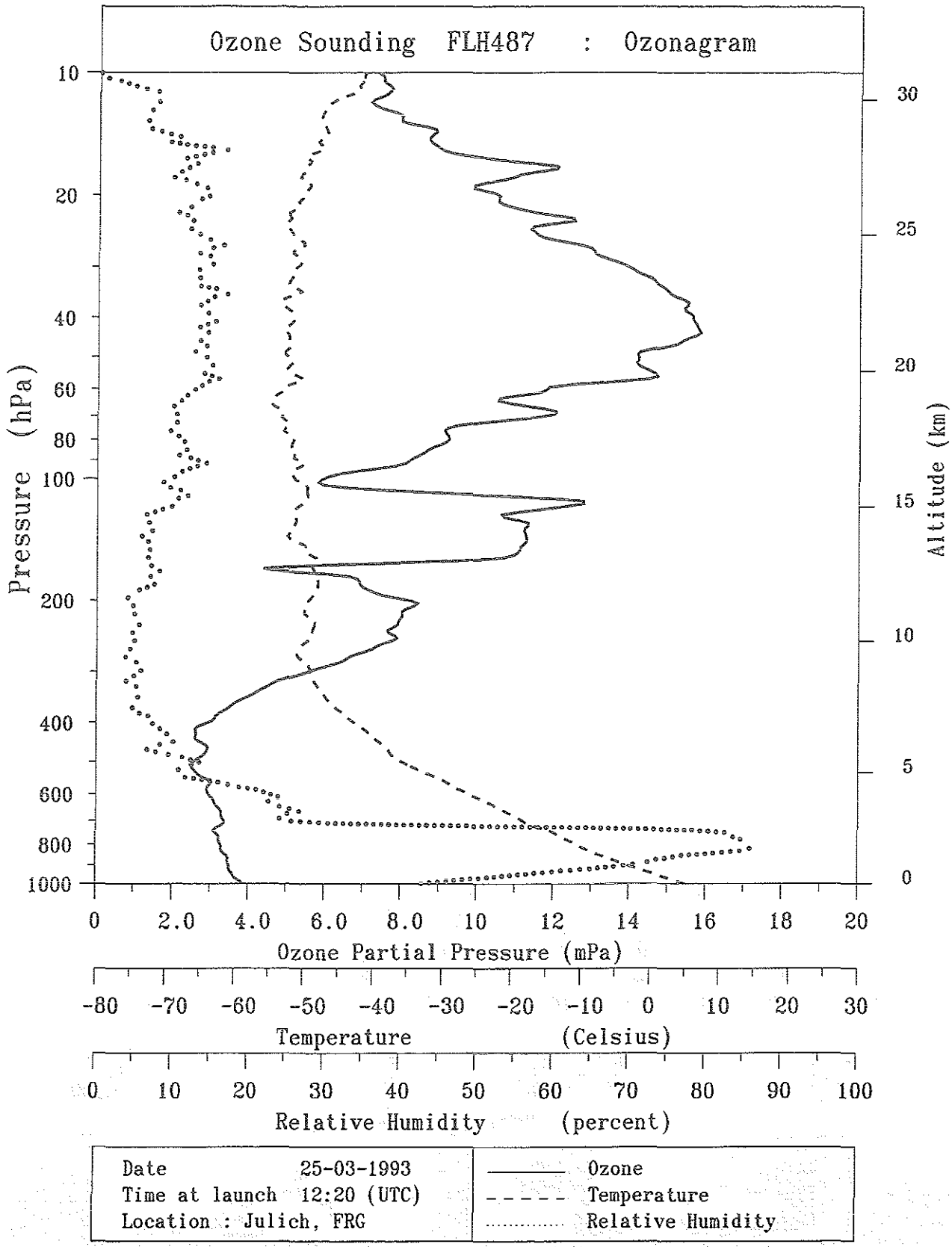
Individual vertical profiles at Jülich

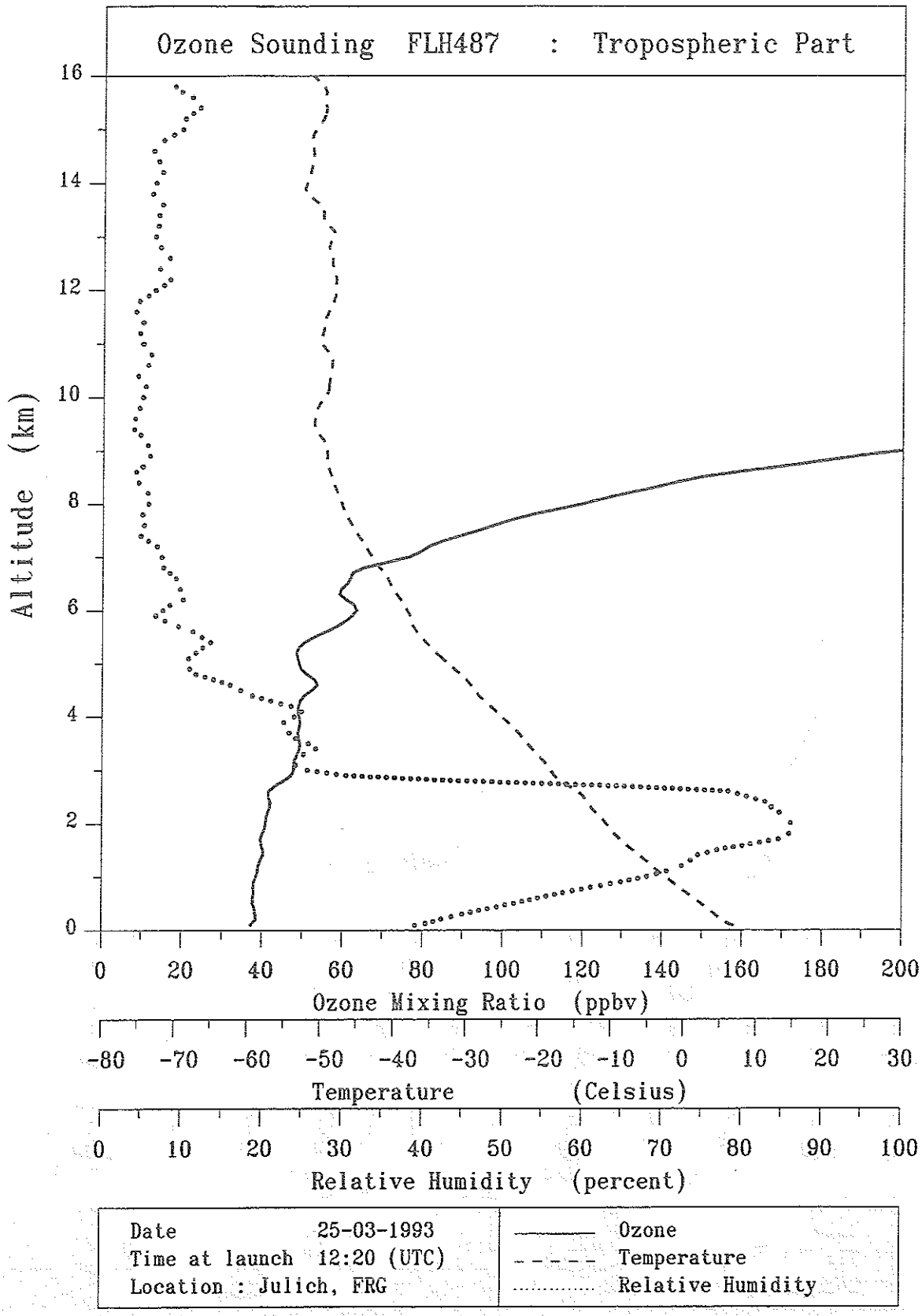

Ozone Sounding FLH485 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 23-03-1993
Time at launch 12:45 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

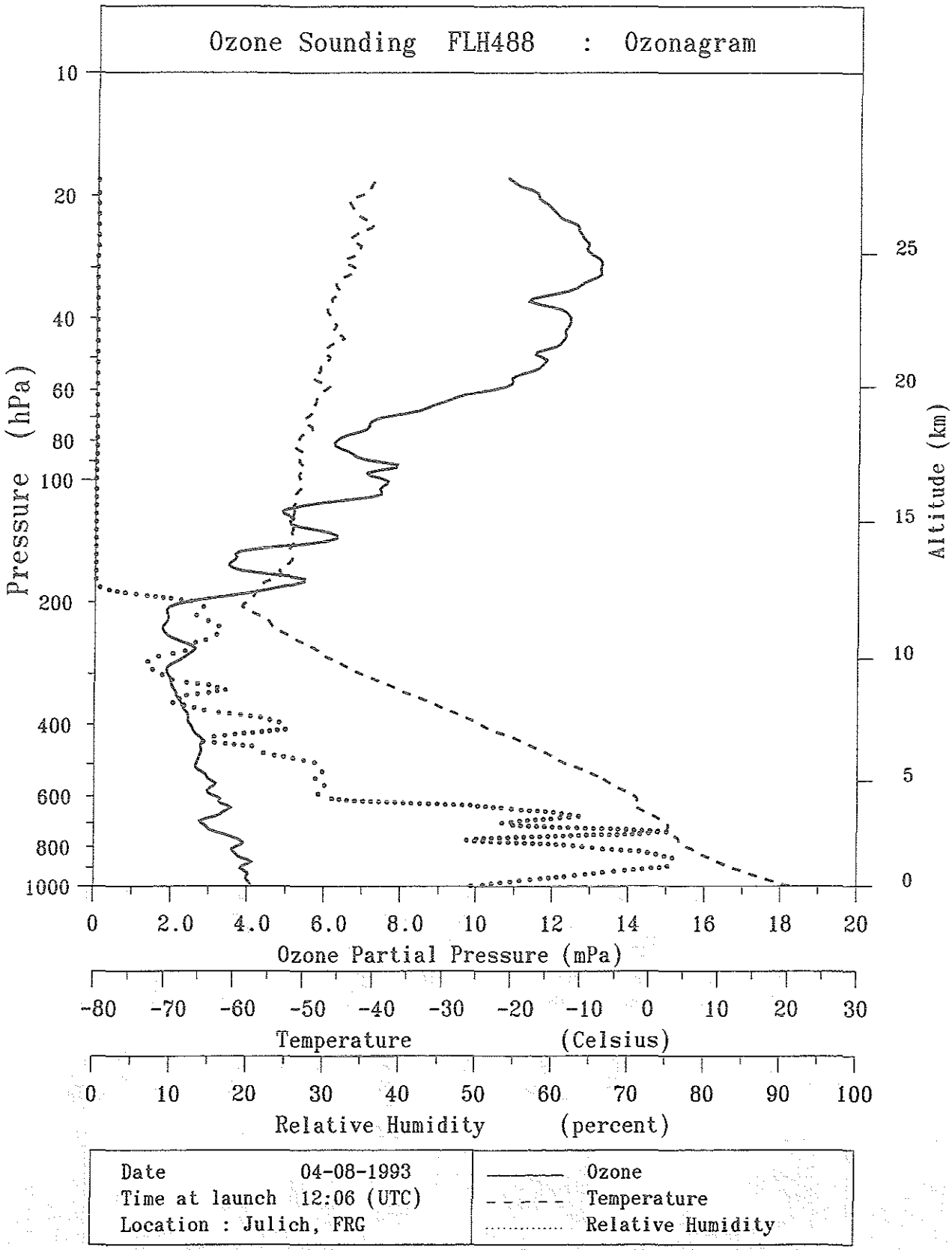

Ozone Sounding FLH485 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 23-03-1993
Time at launch 12:45 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

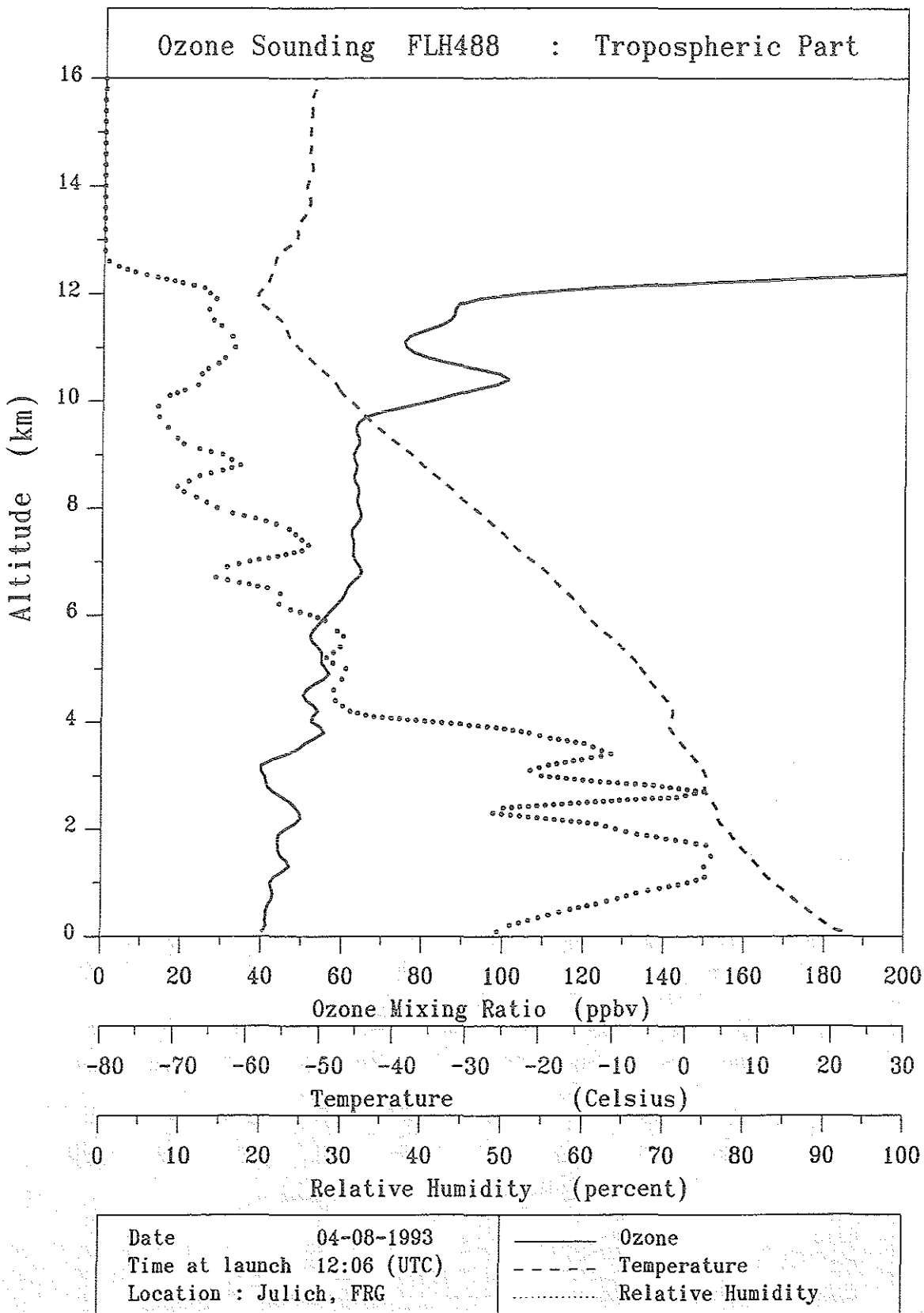

Ozone Sounding FLH486 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 24-03-1993
Time at launch 12:05 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

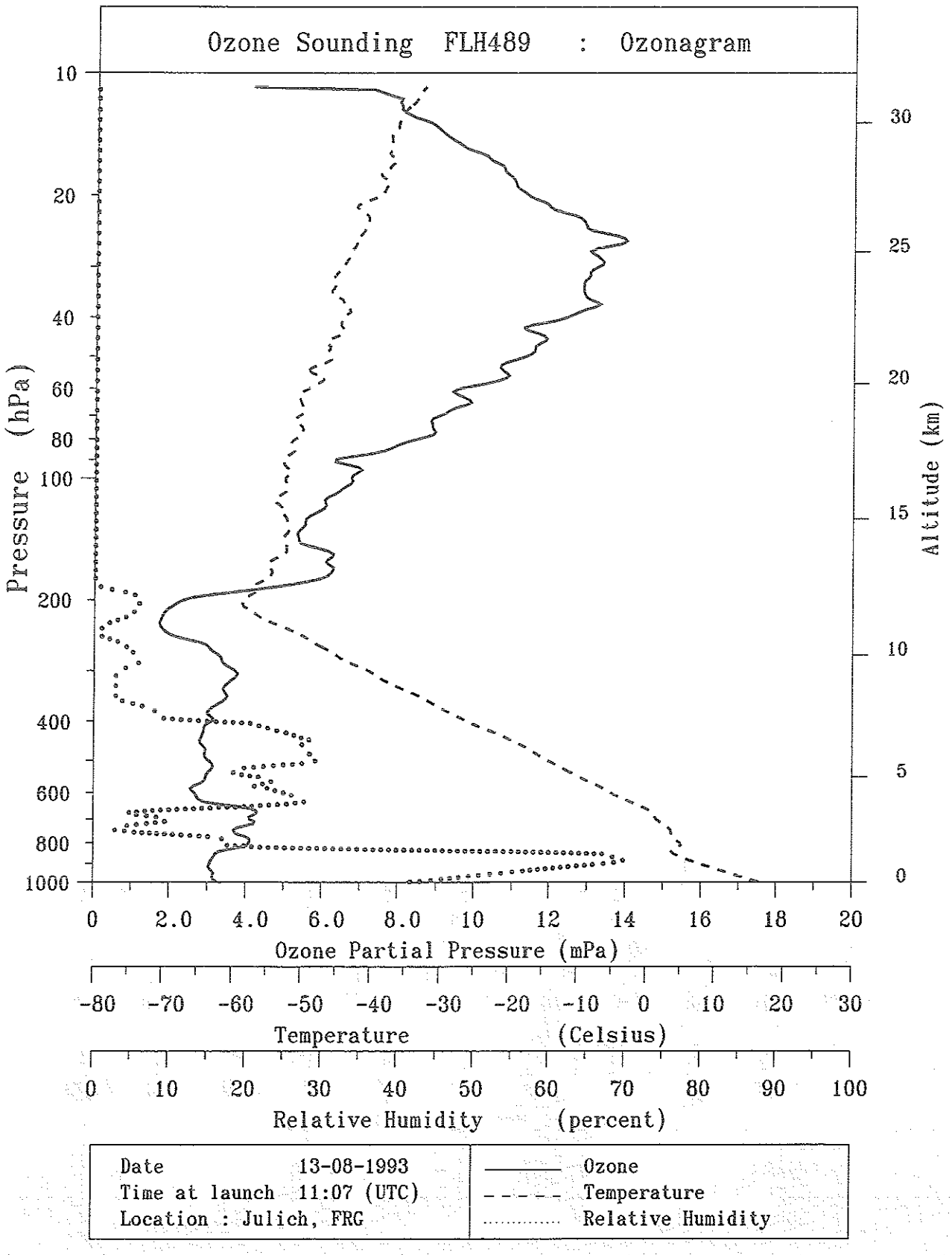

Ozone Sounding FLH486 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 24-03-1993
Time at launch 12:05 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

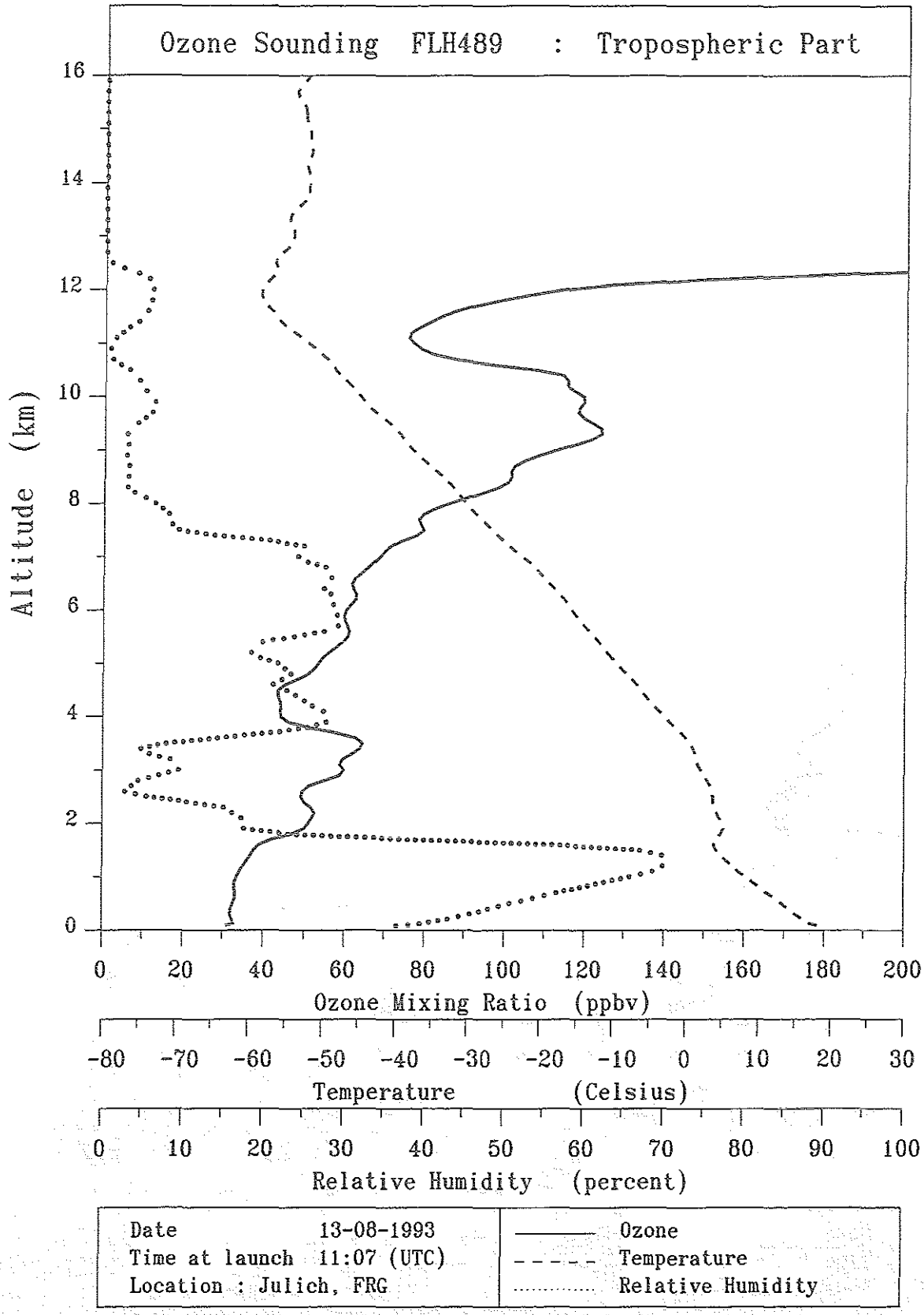

Ozone Sounding FLH487 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 25-03-1993
Time at launch 12:20 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

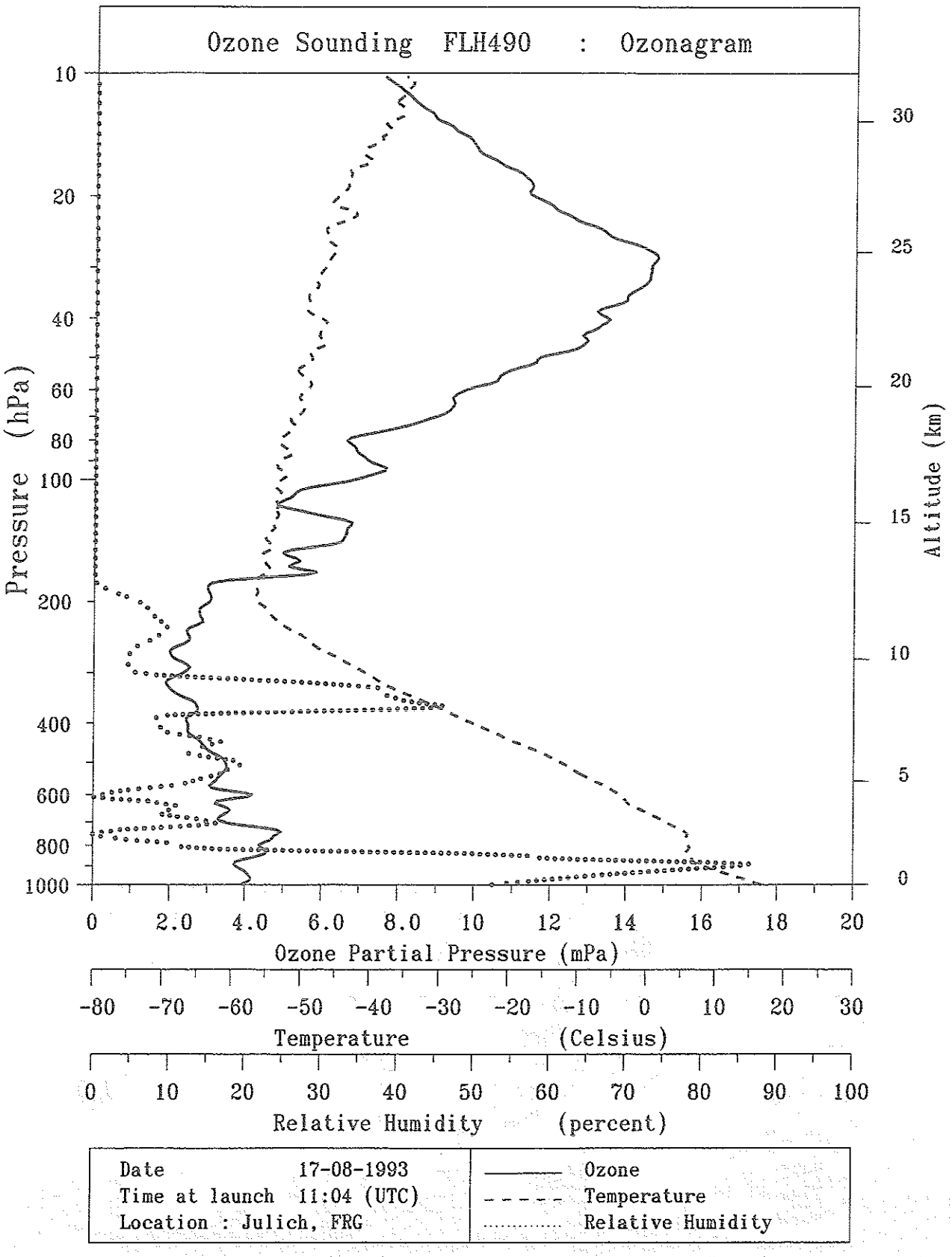

Ozone Sounding FLH487 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 25-03-1993
Time at launch 12:20 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

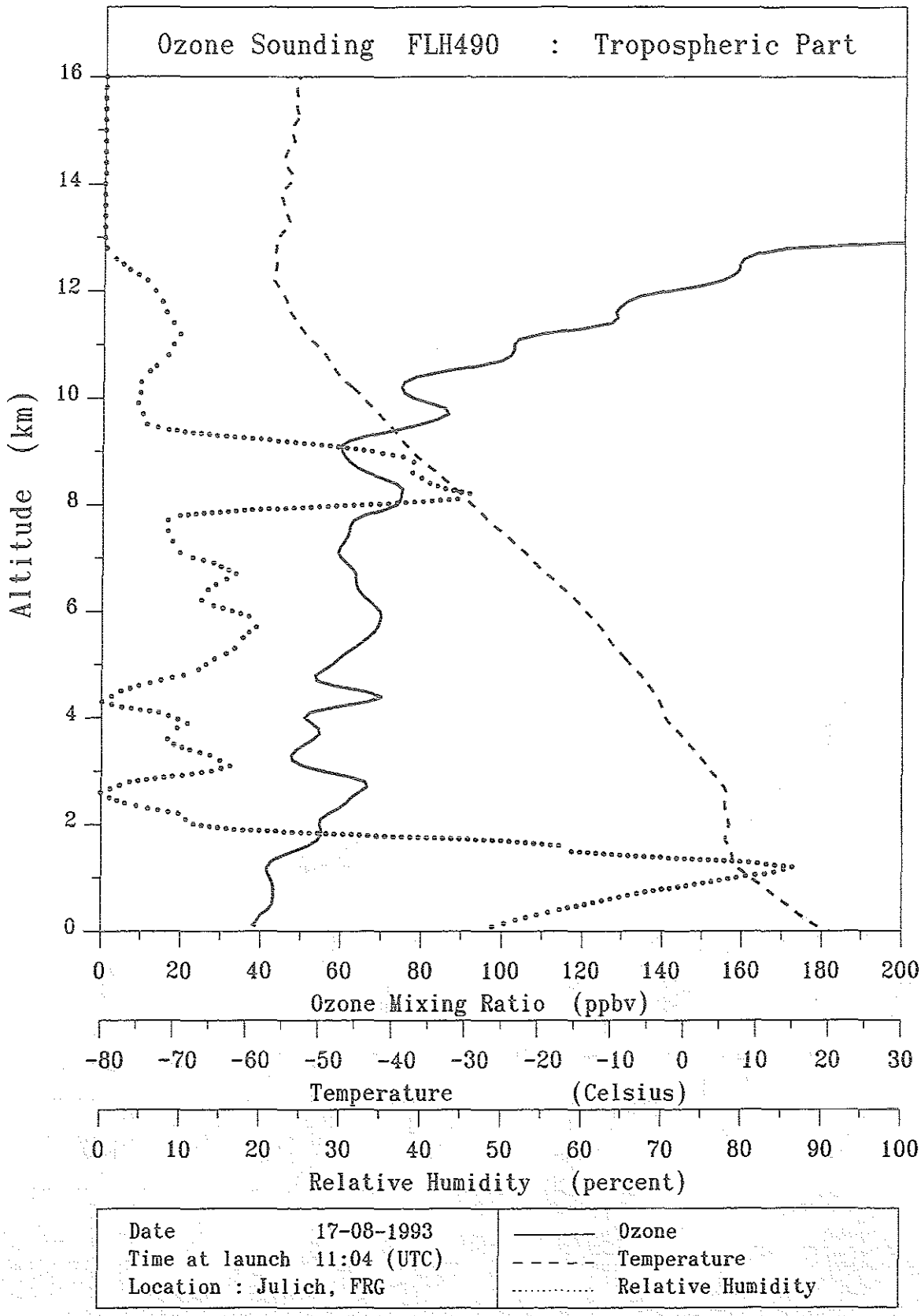

Ozone Sounding FLH488 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 04-08-1993
Time at launch 12:06 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

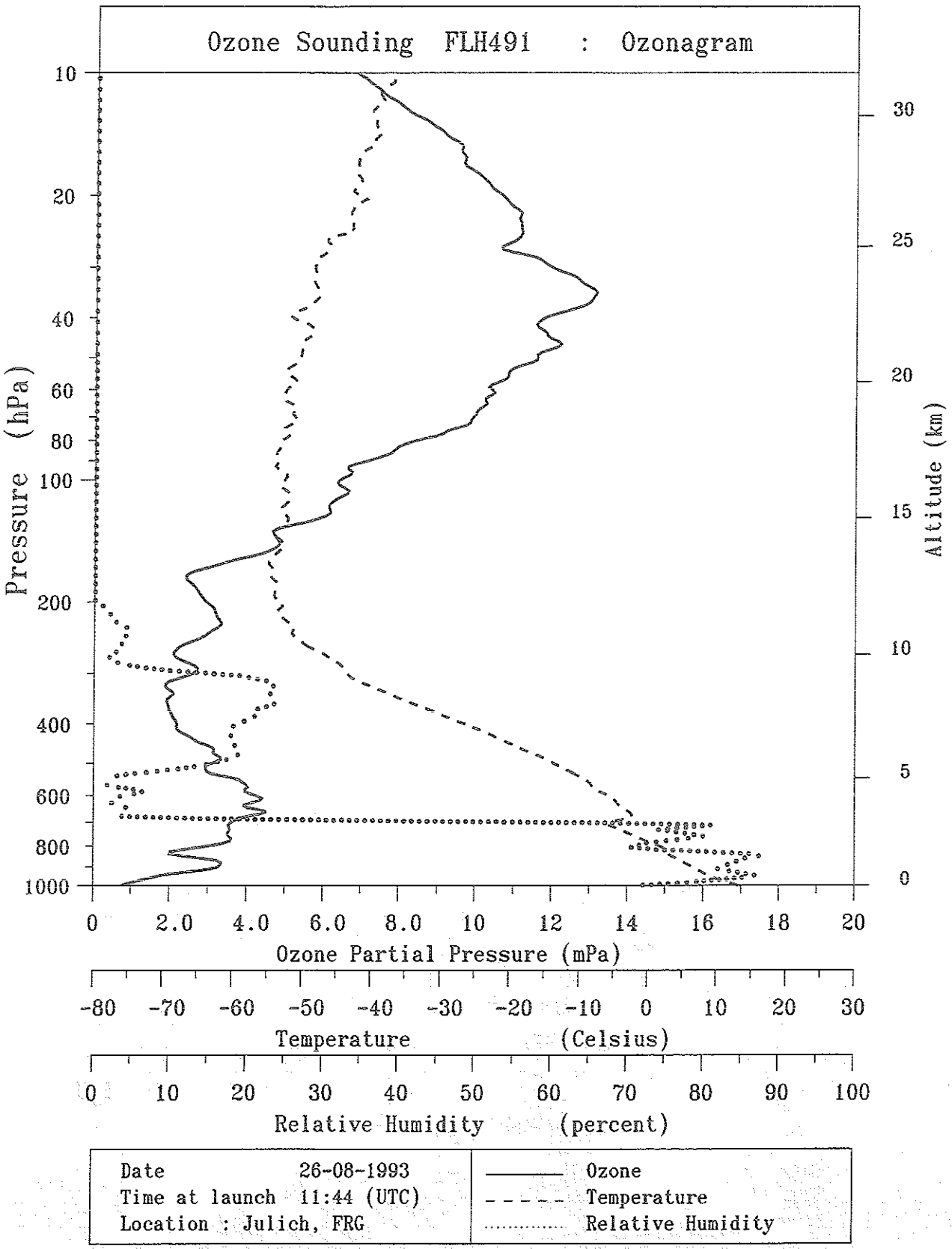

Ozone Sounding FLH488 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 04-08-1993
Time at launch 12:06 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

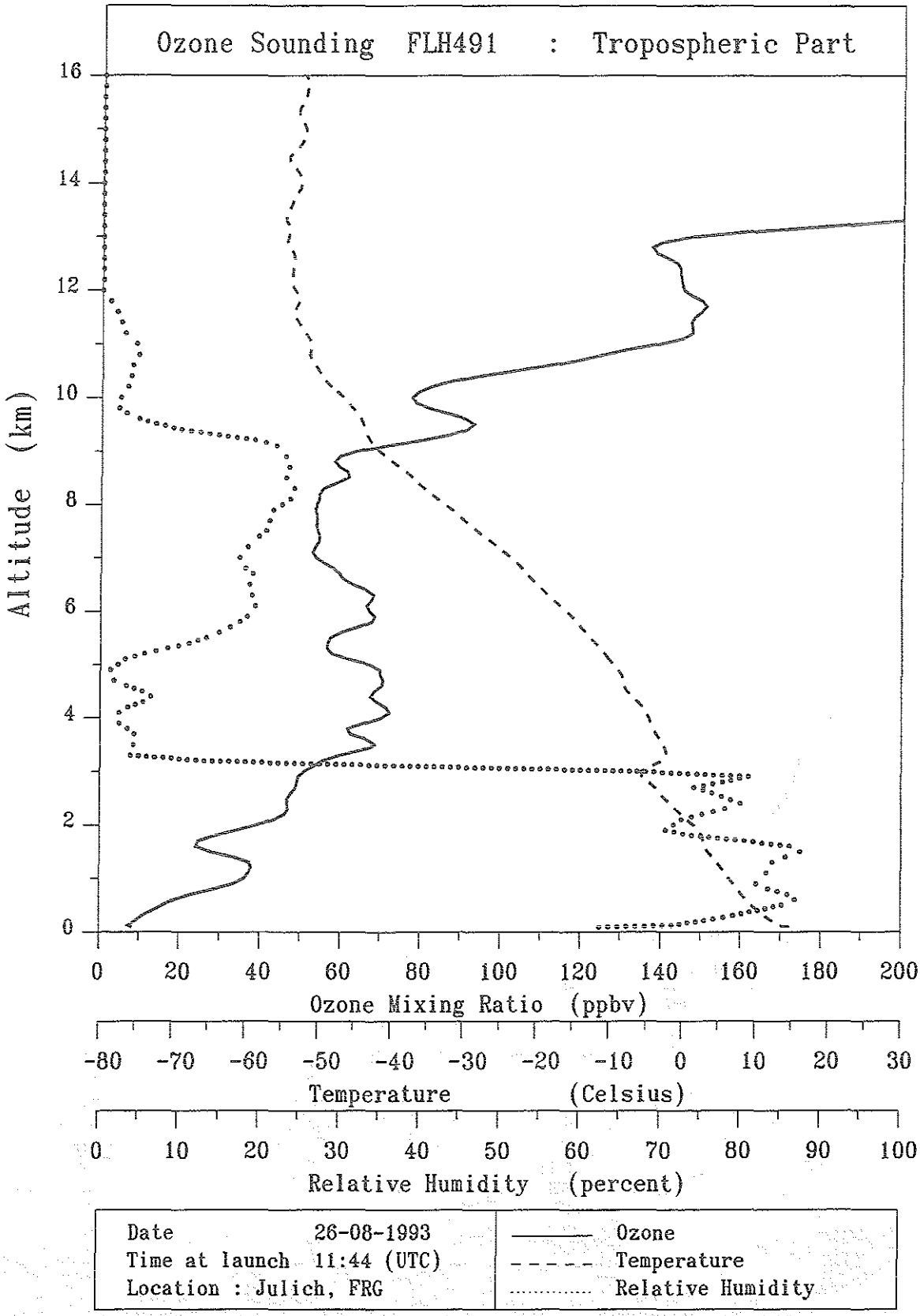

Ozone Sounding FLH489 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 13-08-1993
Time at launch 11:07 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

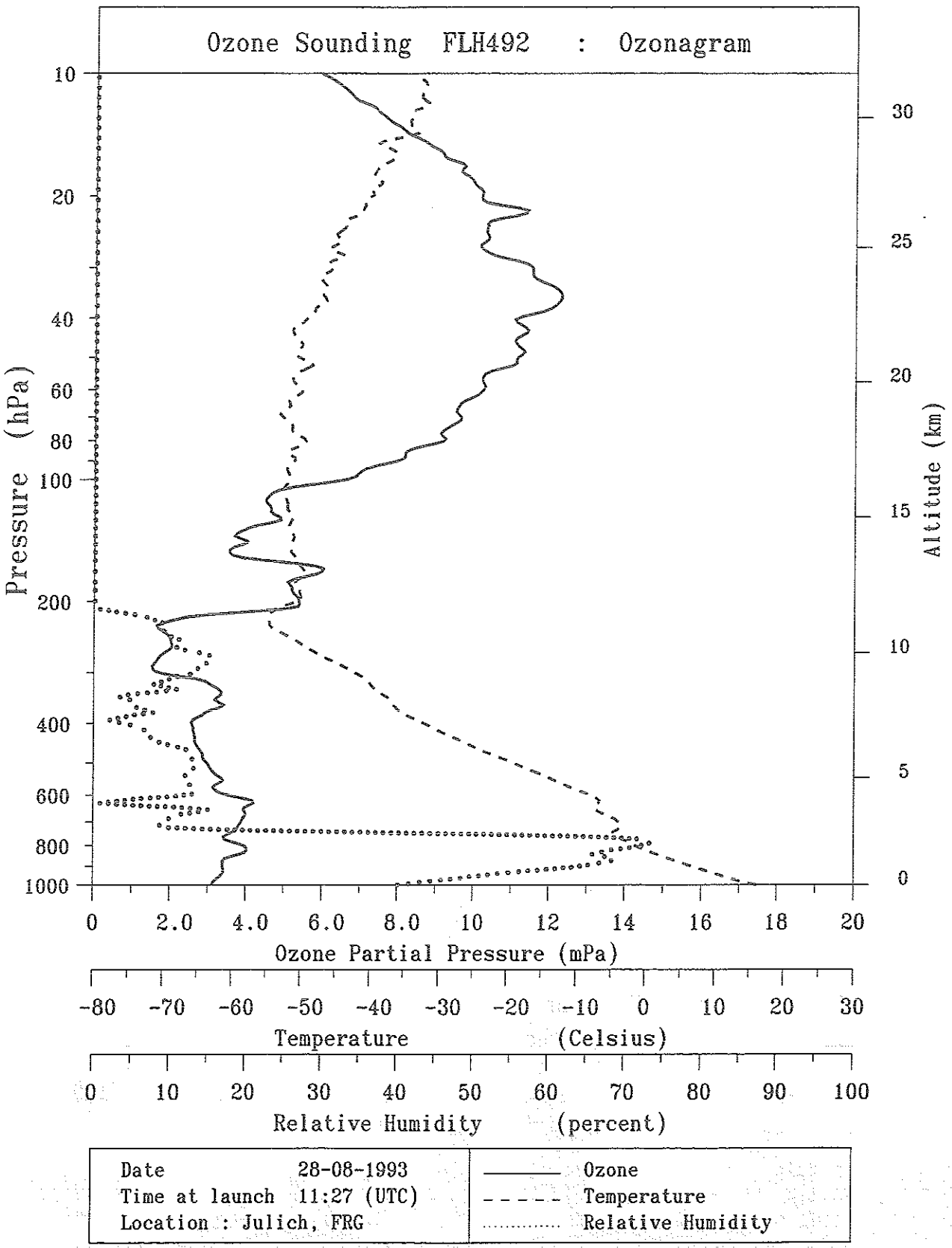

Ozone Sounding FLH489 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 13-08-1993
Time at launch 11:07 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

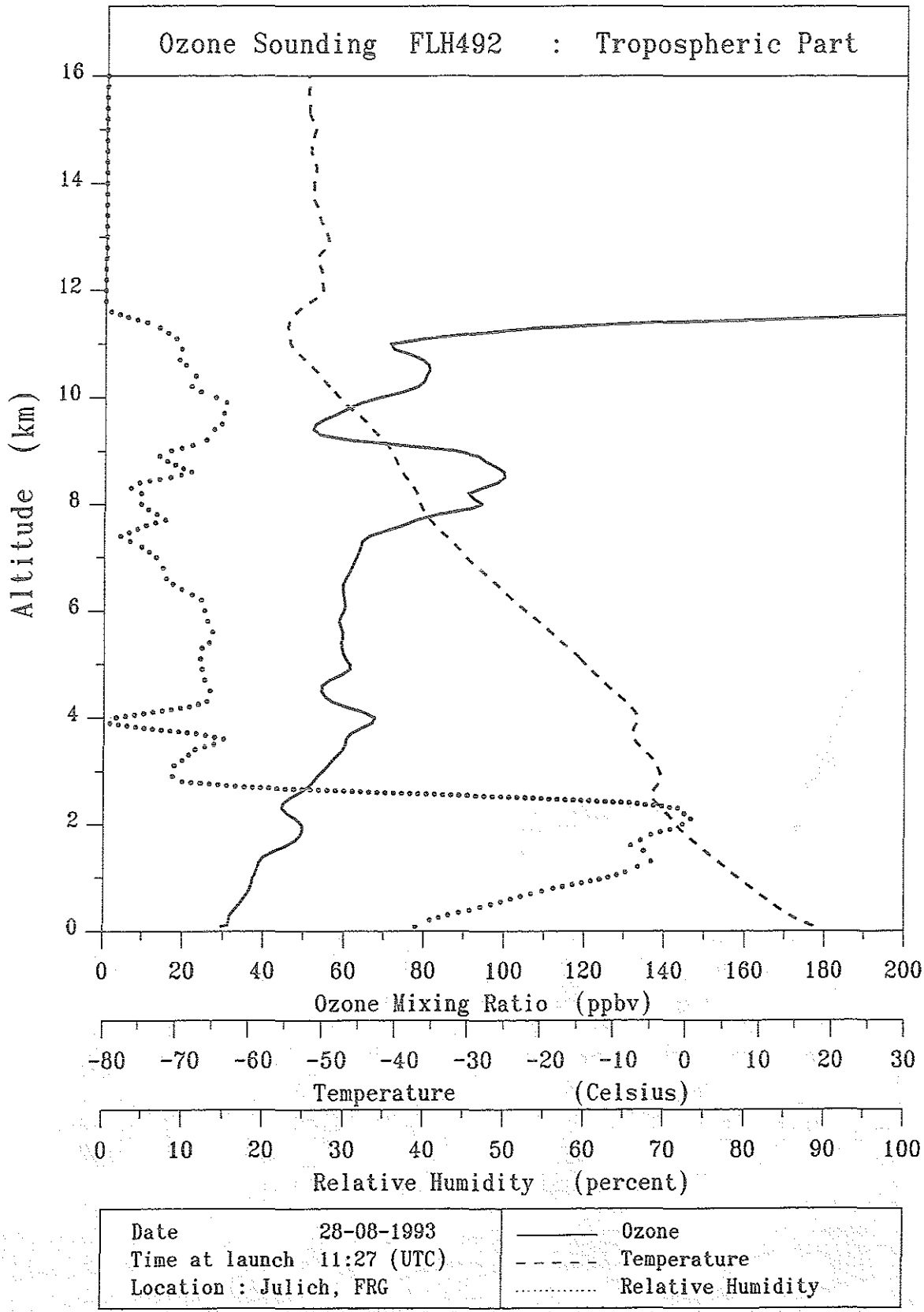

Ozone Sounding FLH490 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 17-08-1993
Time at launch 11:04 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

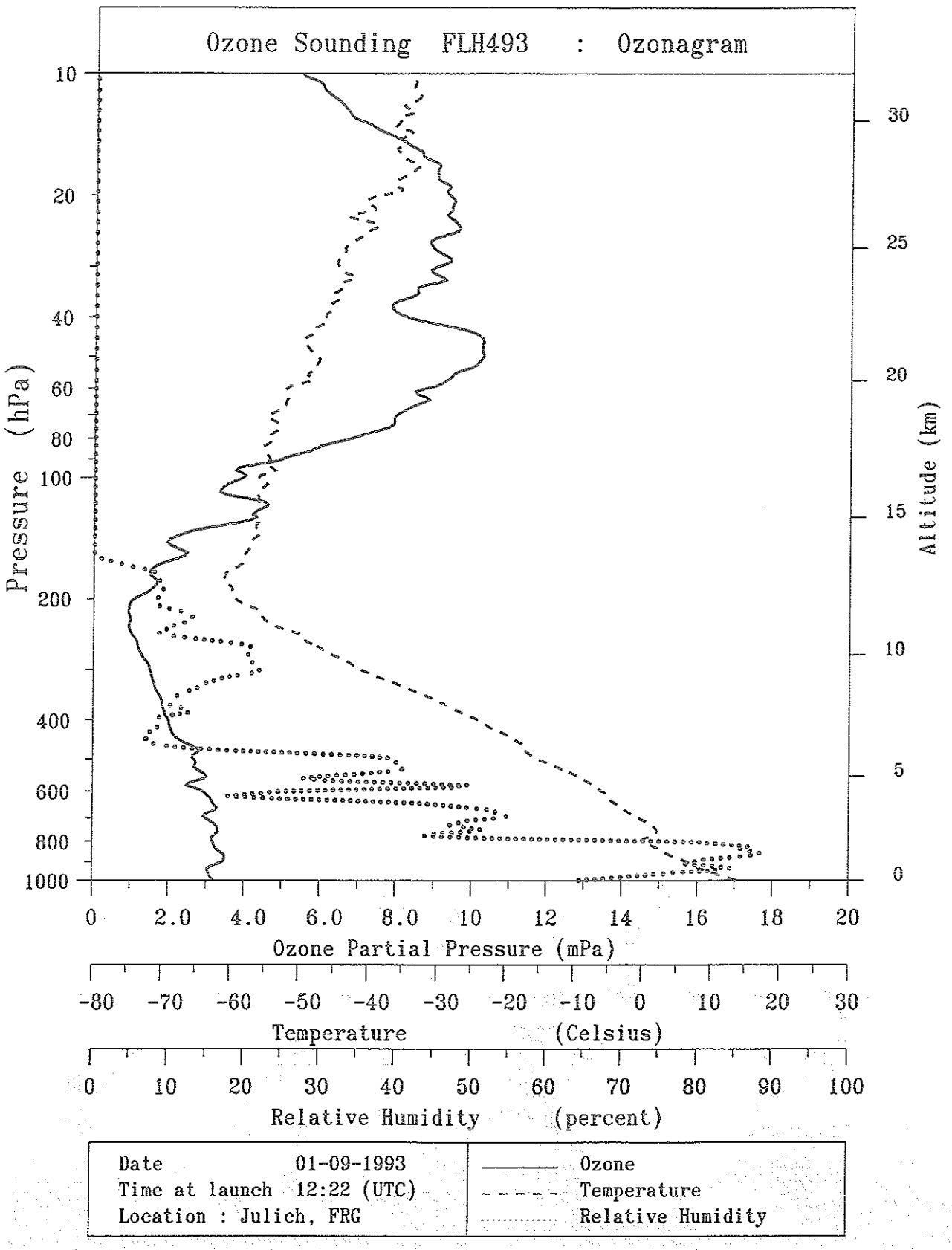

Ozone Sounding FLH490 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 17-08-1993
Time at launch 11:04 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

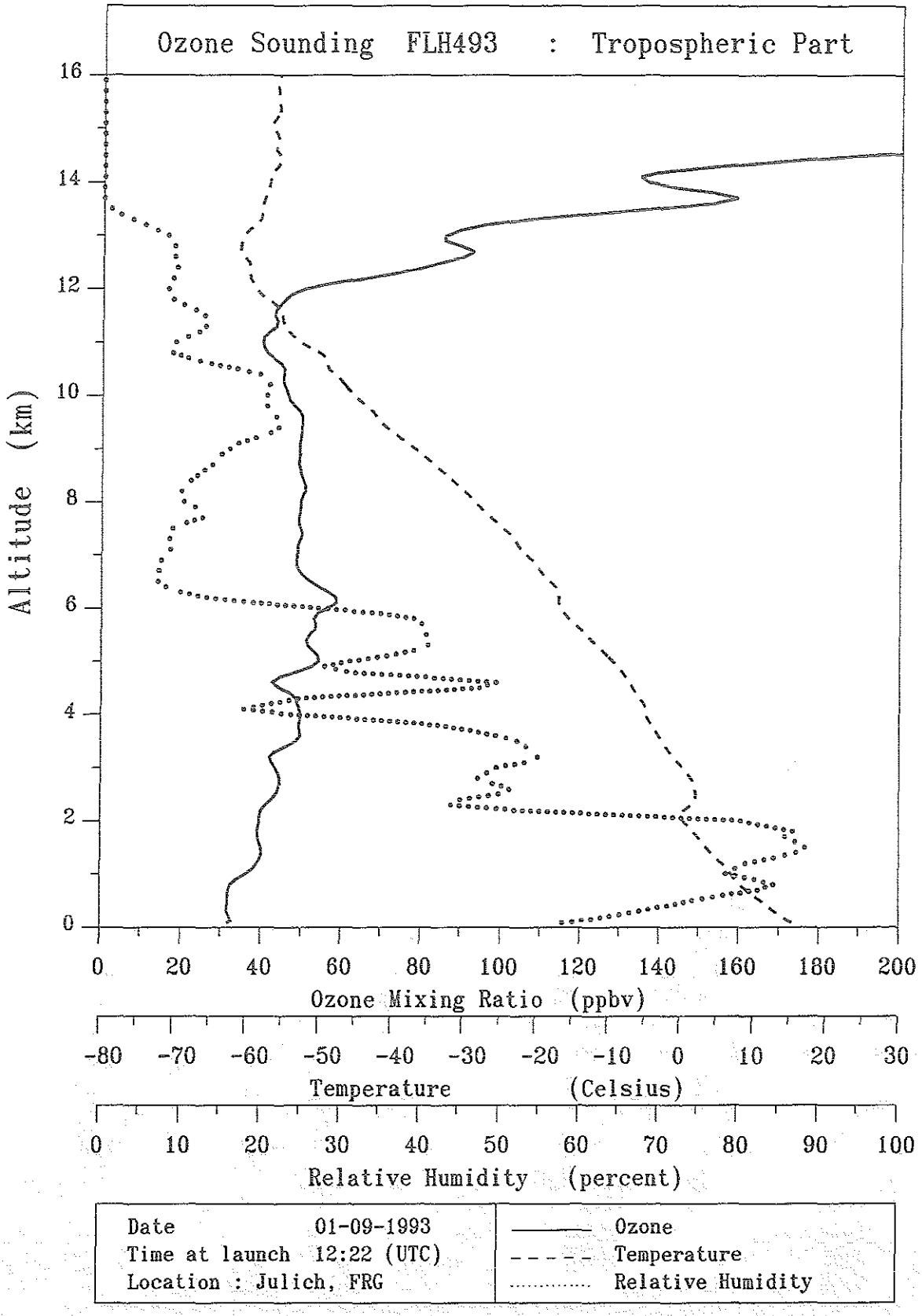

Ozone Sounding FLH491 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 26-08-1993
Time at launch 11:44 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

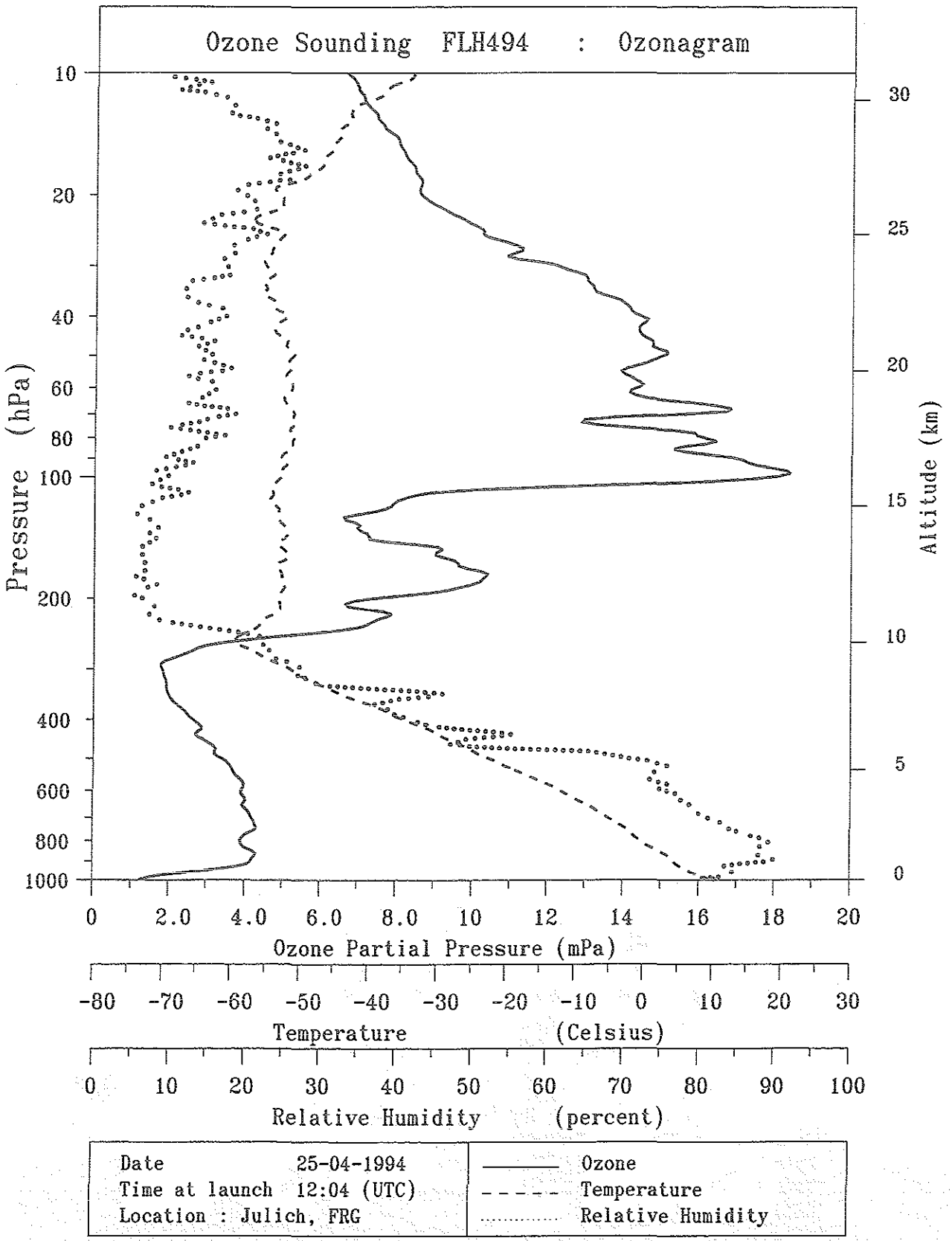

Ozone Sounding FLH491 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 26-08-1993
Time at launch 11:44 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

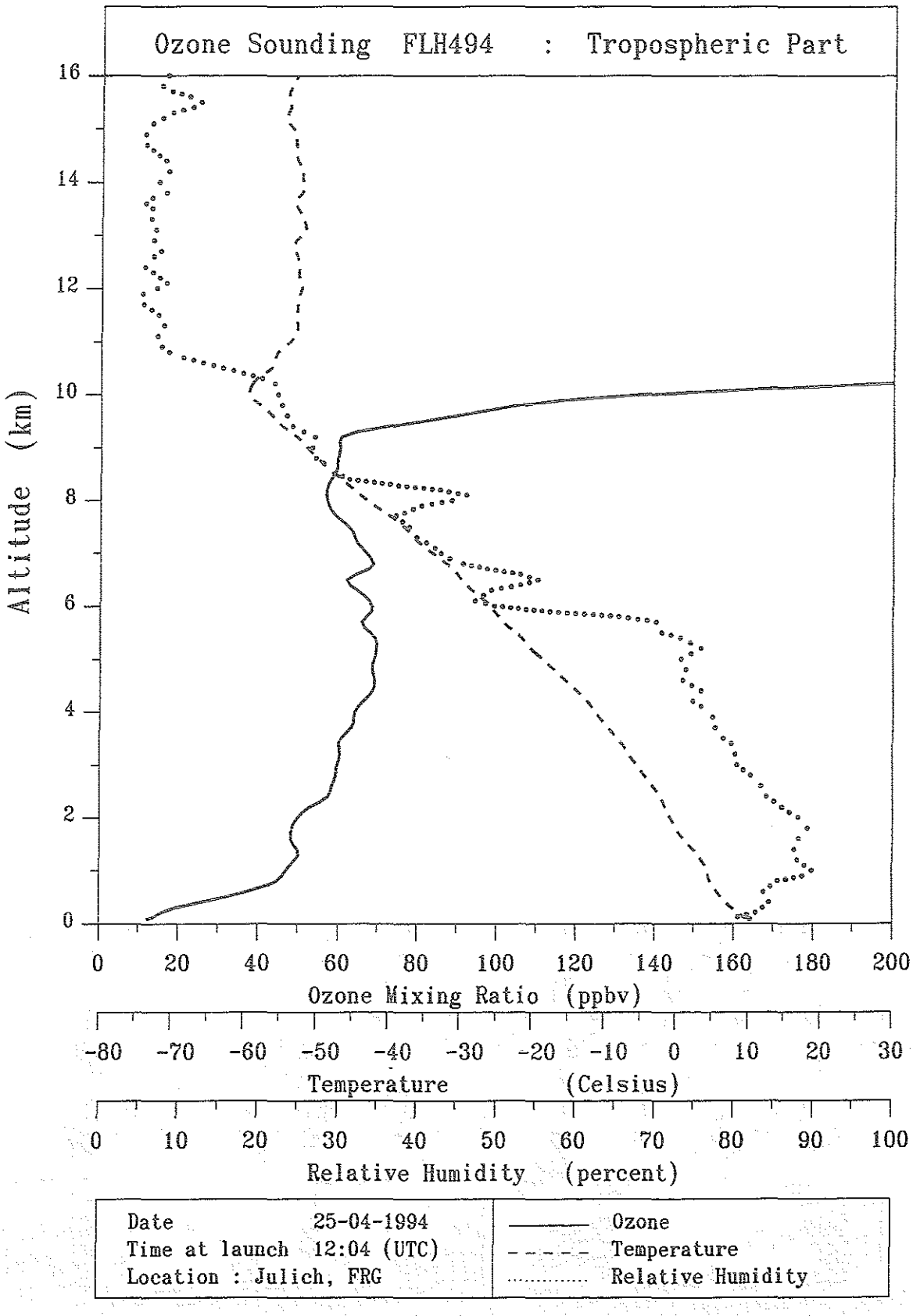

Ozone Sounding FLH492 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 28-08-1993
Time at launch 11:27 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

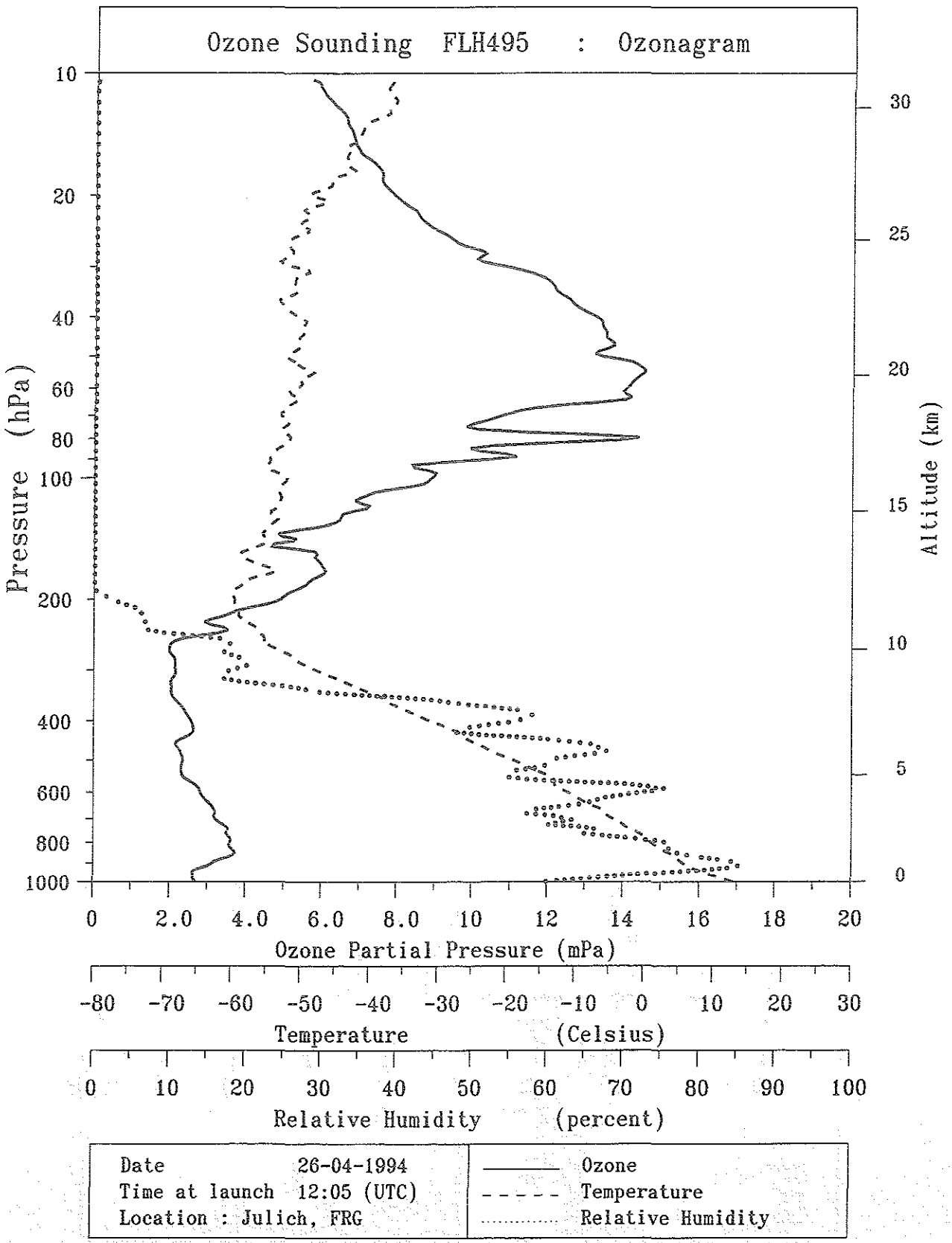

Ozone Sounding FLH492 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 28-08-1993
Time at launch 11:27 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

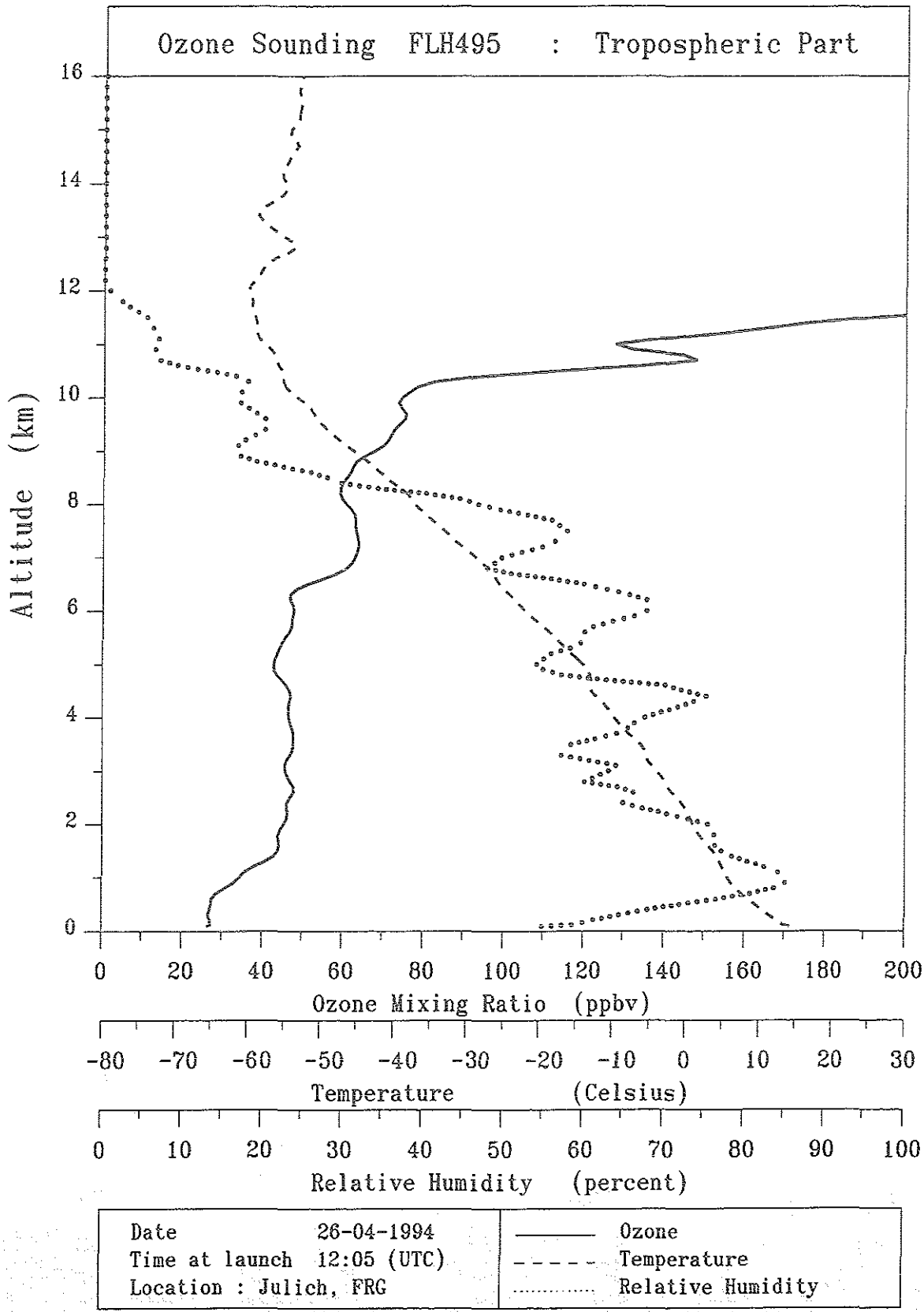

Ozone Sounding FLH493 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 01-09-1993
Time at launch 12:22 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

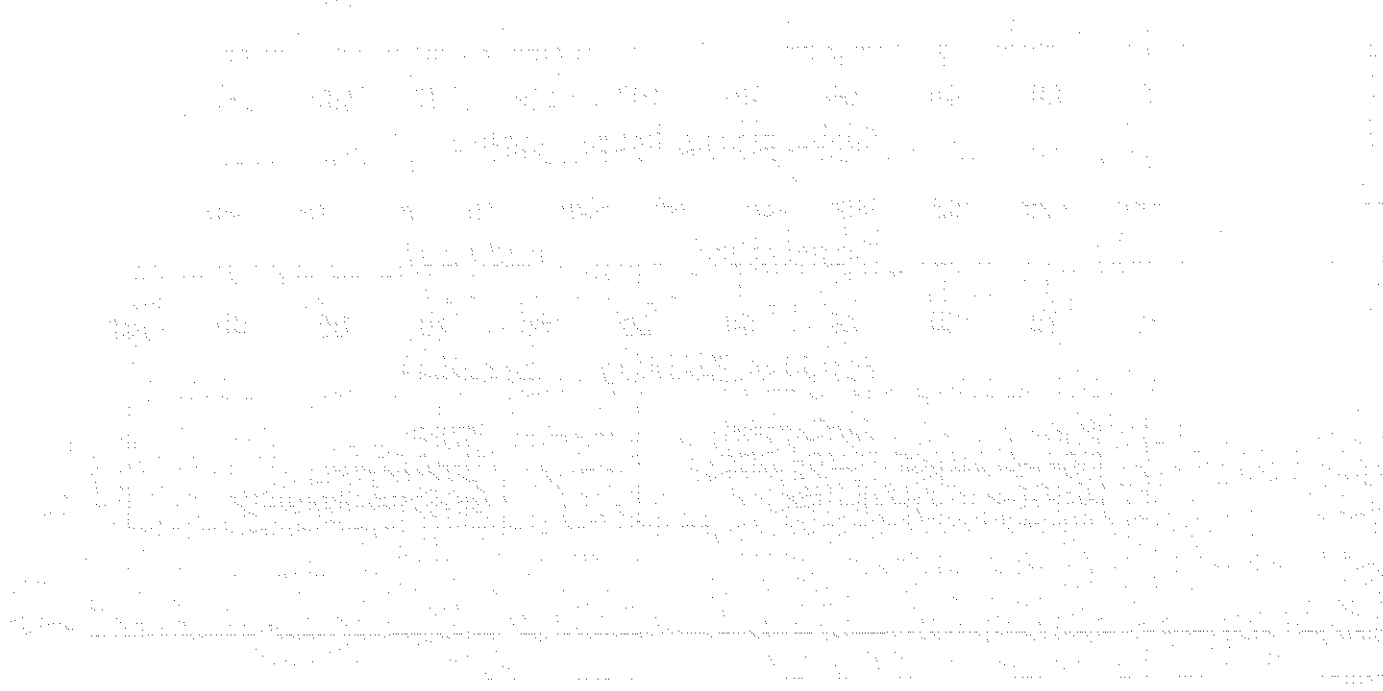

Ozone Sounding FLH493 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 01-09-1993
Time at launch 12:22 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity


Ozone Sounding FLH494 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 25-04-1994
Time at launch 12:04 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

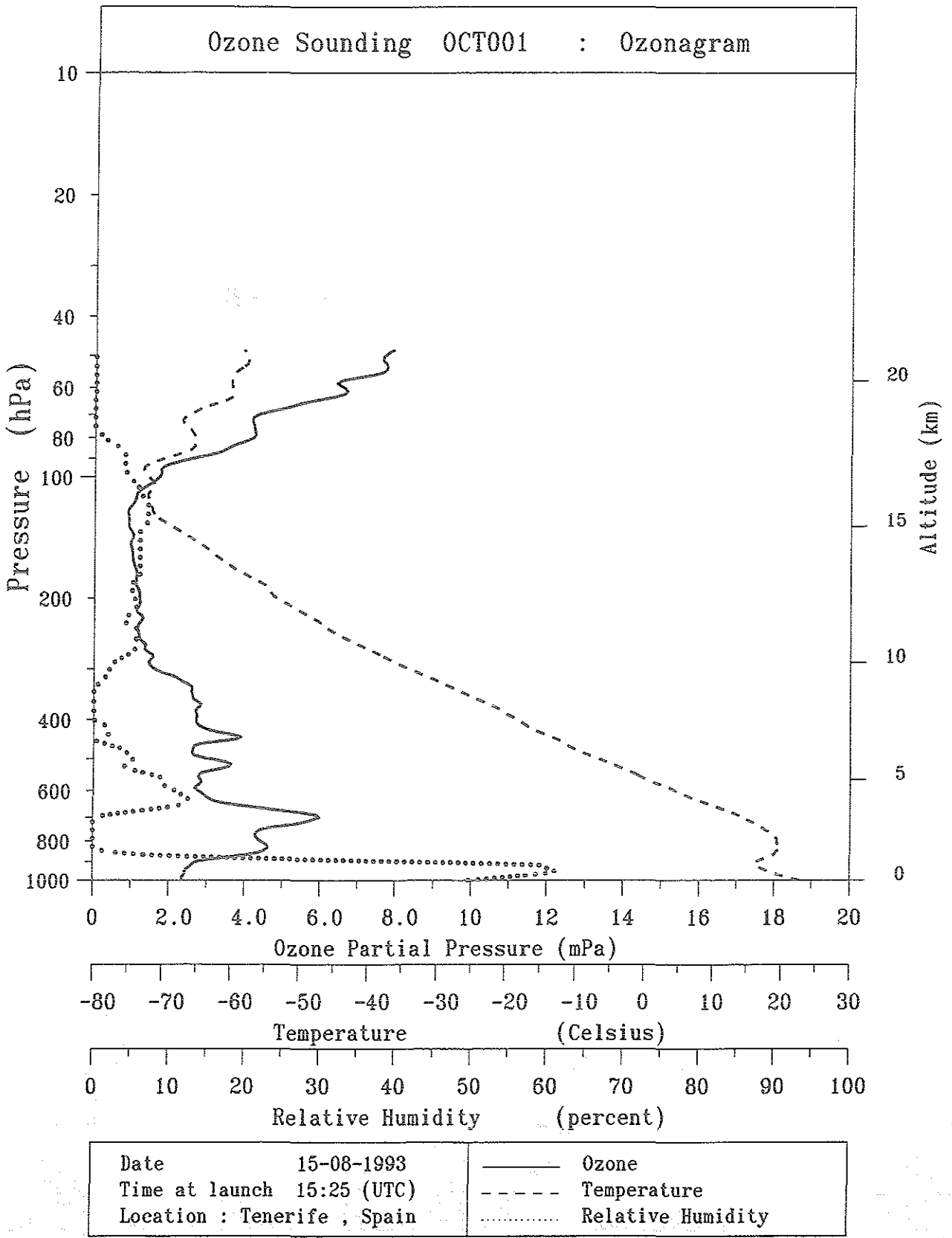

Ozone Sounding FLH494 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 25-04-1994
Time at launch 12:04 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

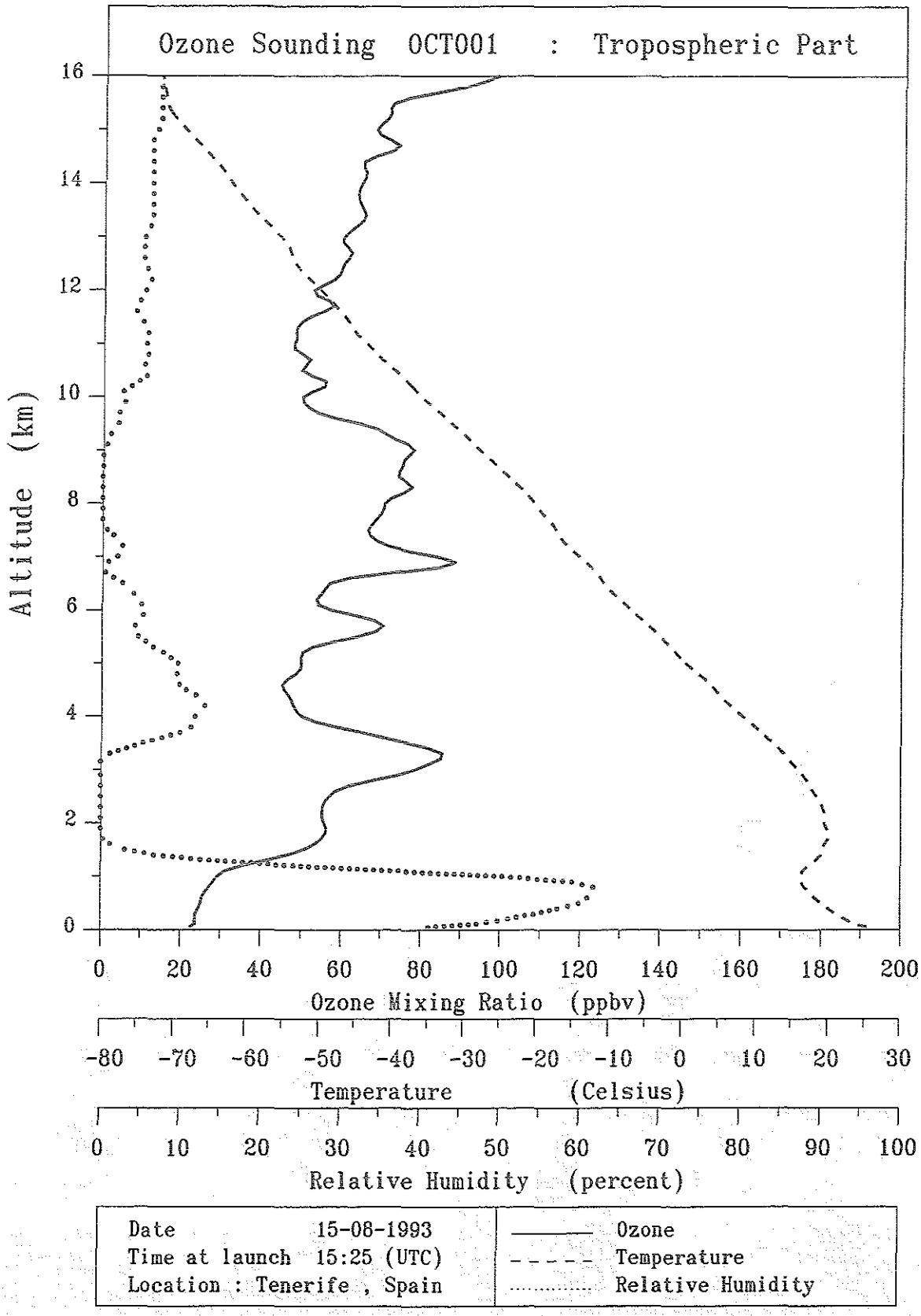

Ozone Sounding FLH495 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 26-04-1994
Time at launch 12:05 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

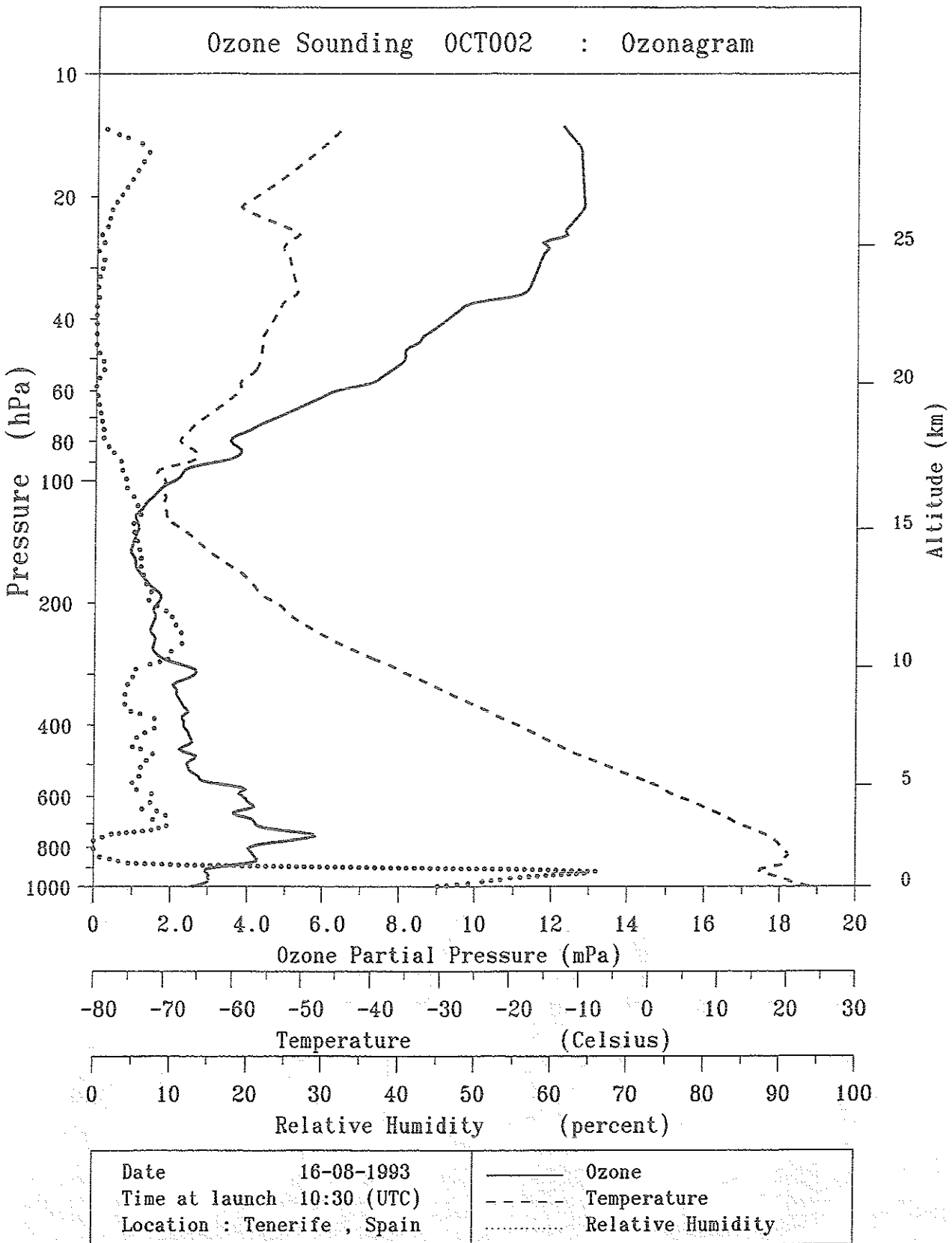

Ozone Sounding FLH495 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 26-04-1994
Time at launch 12:05 (UTC)
Location : Julich, FRG
Ozone
Temperature
Relative Humidity

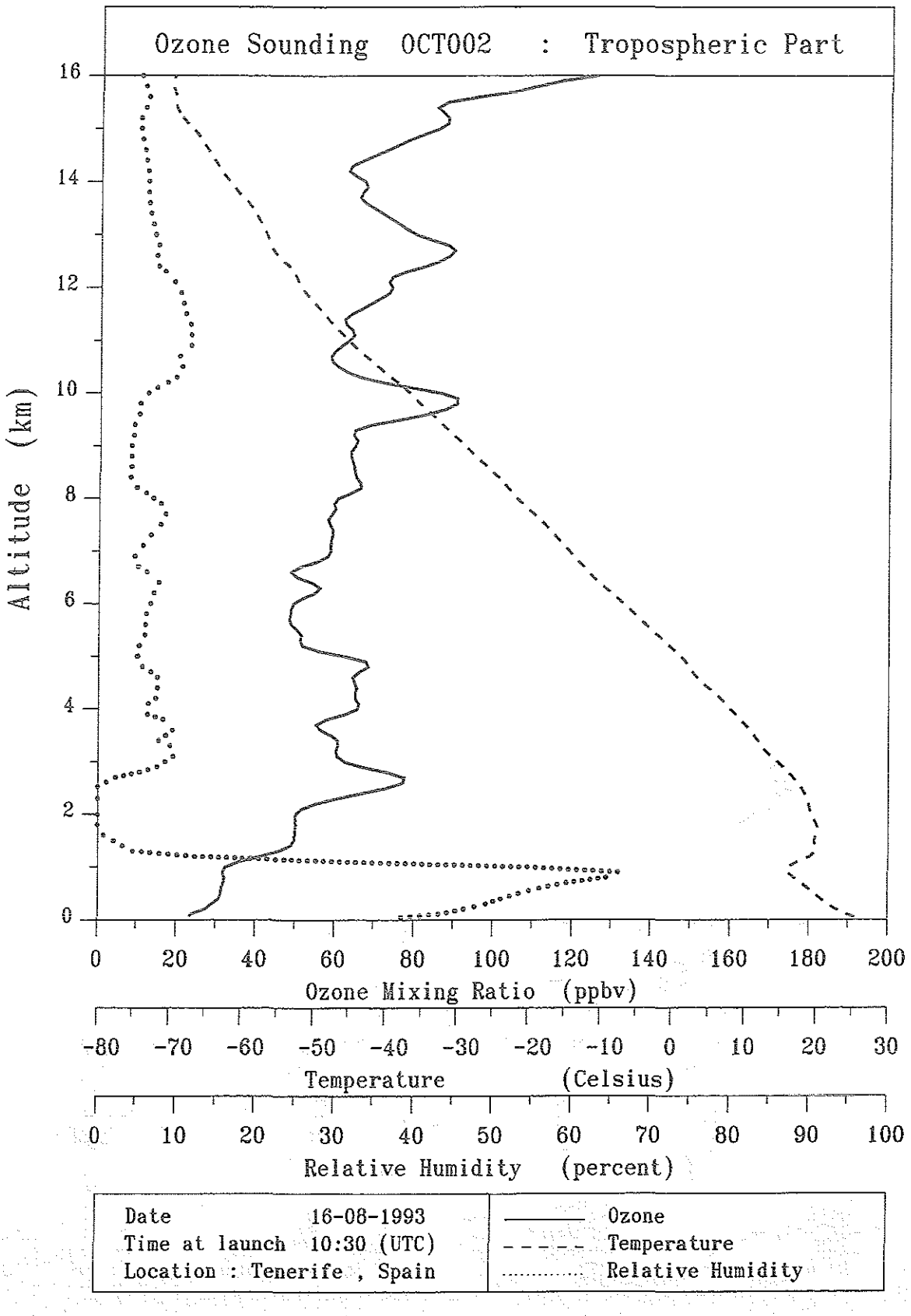


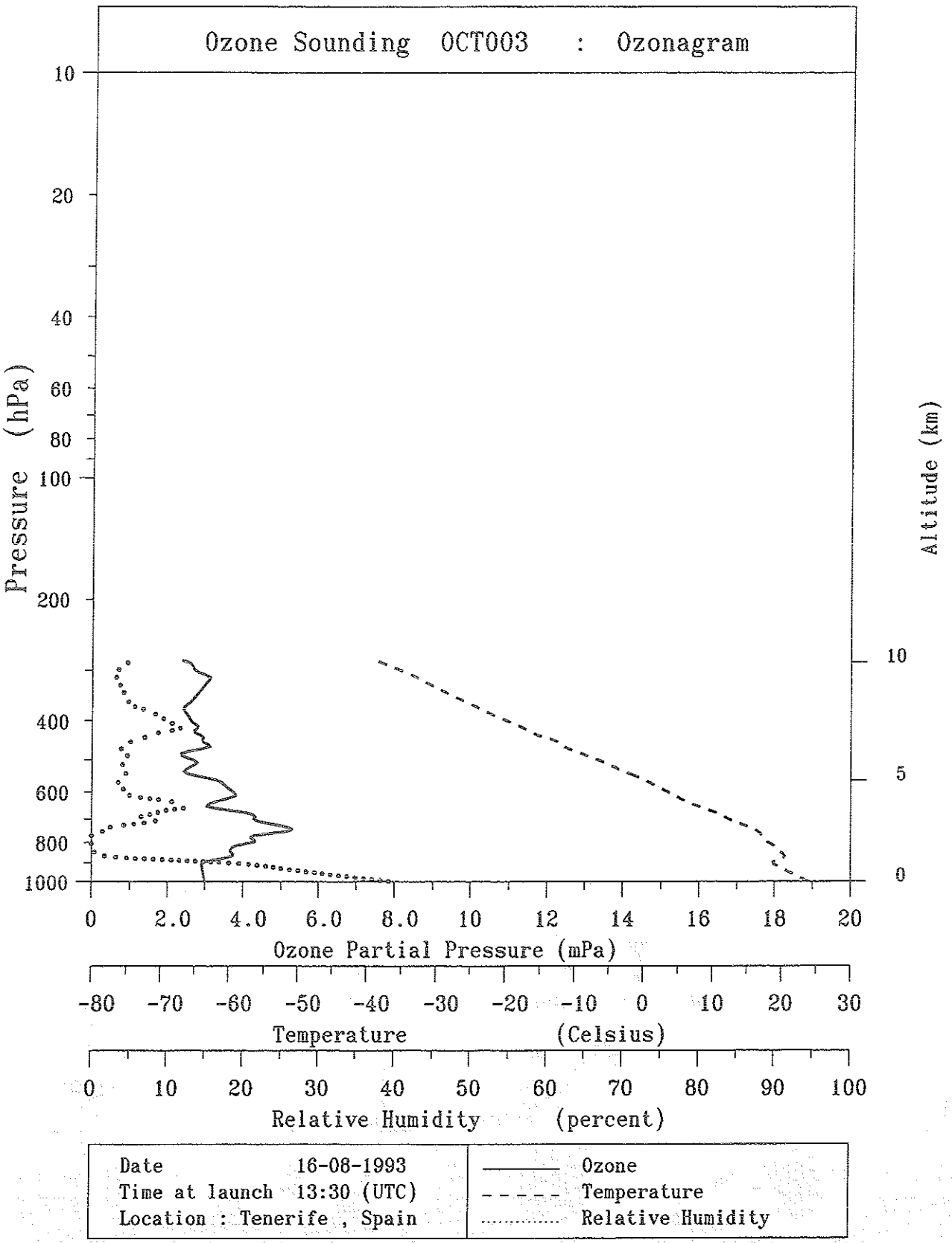
Individual vertical profiles at Santa Cruz de Tenerife

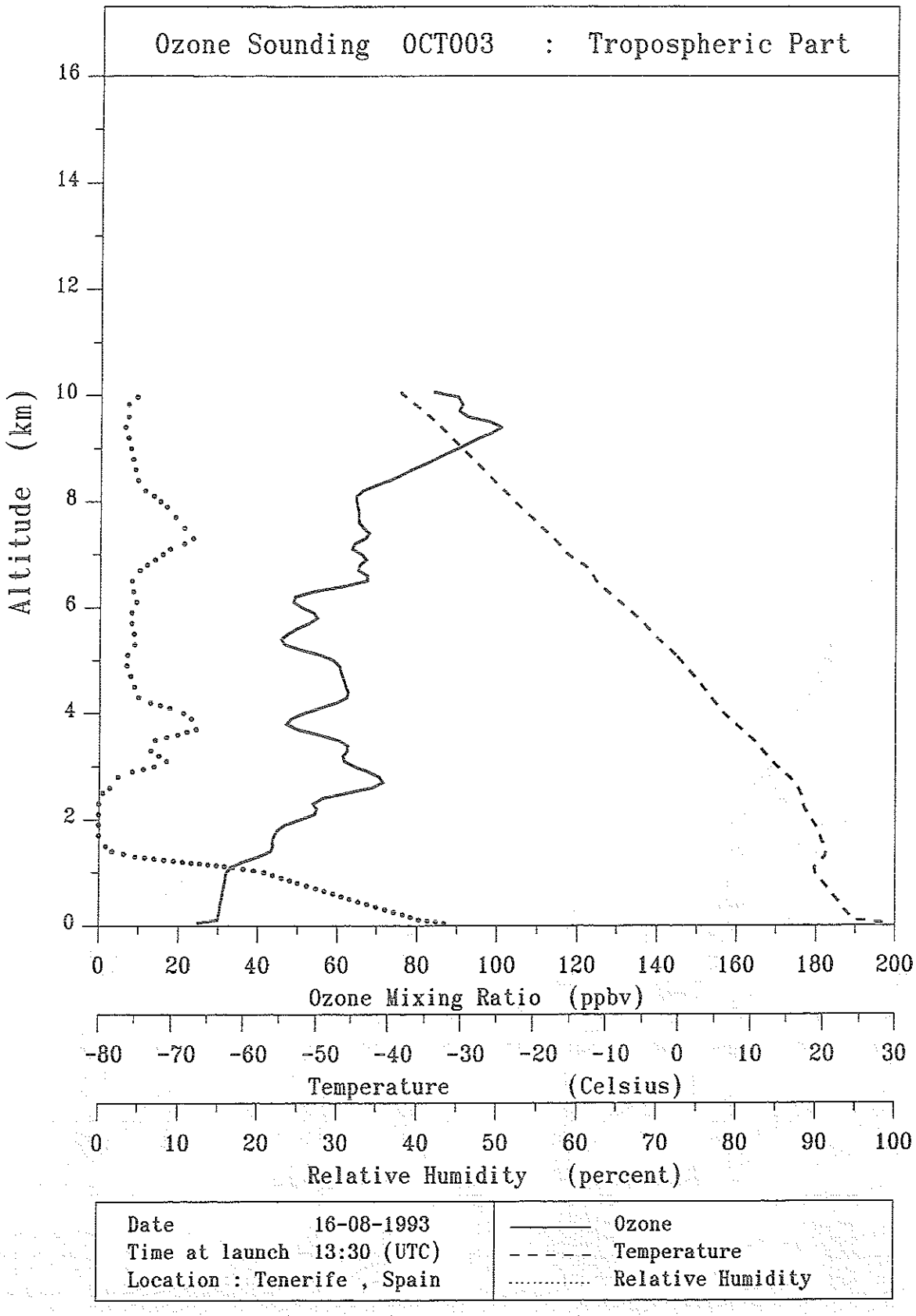

Ozone Sounding OCT001 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 15-08-1993
Time at launch 15:25 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

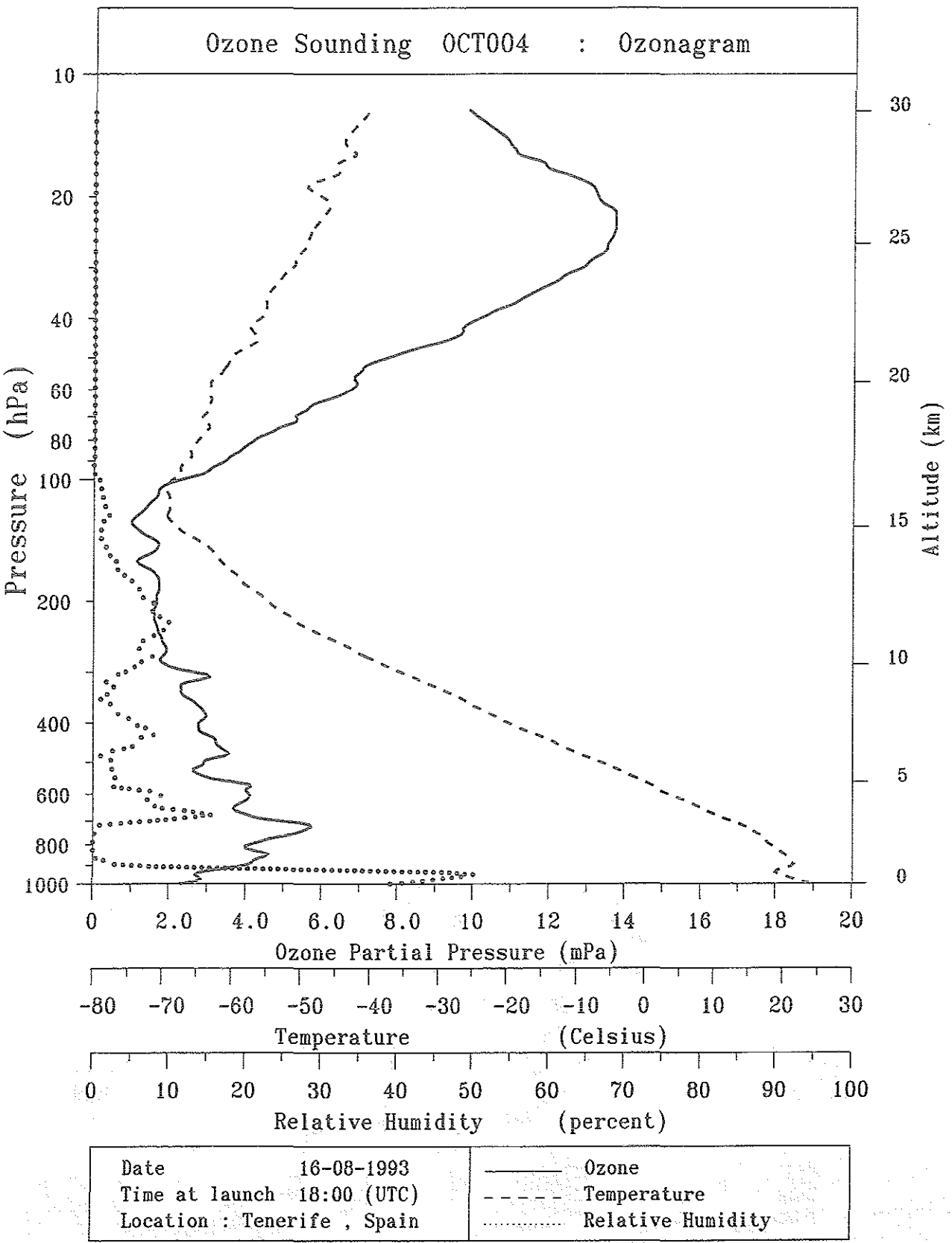

Ozone Sounding OCT001 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 15-08-1993
Time at launch 15:25 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

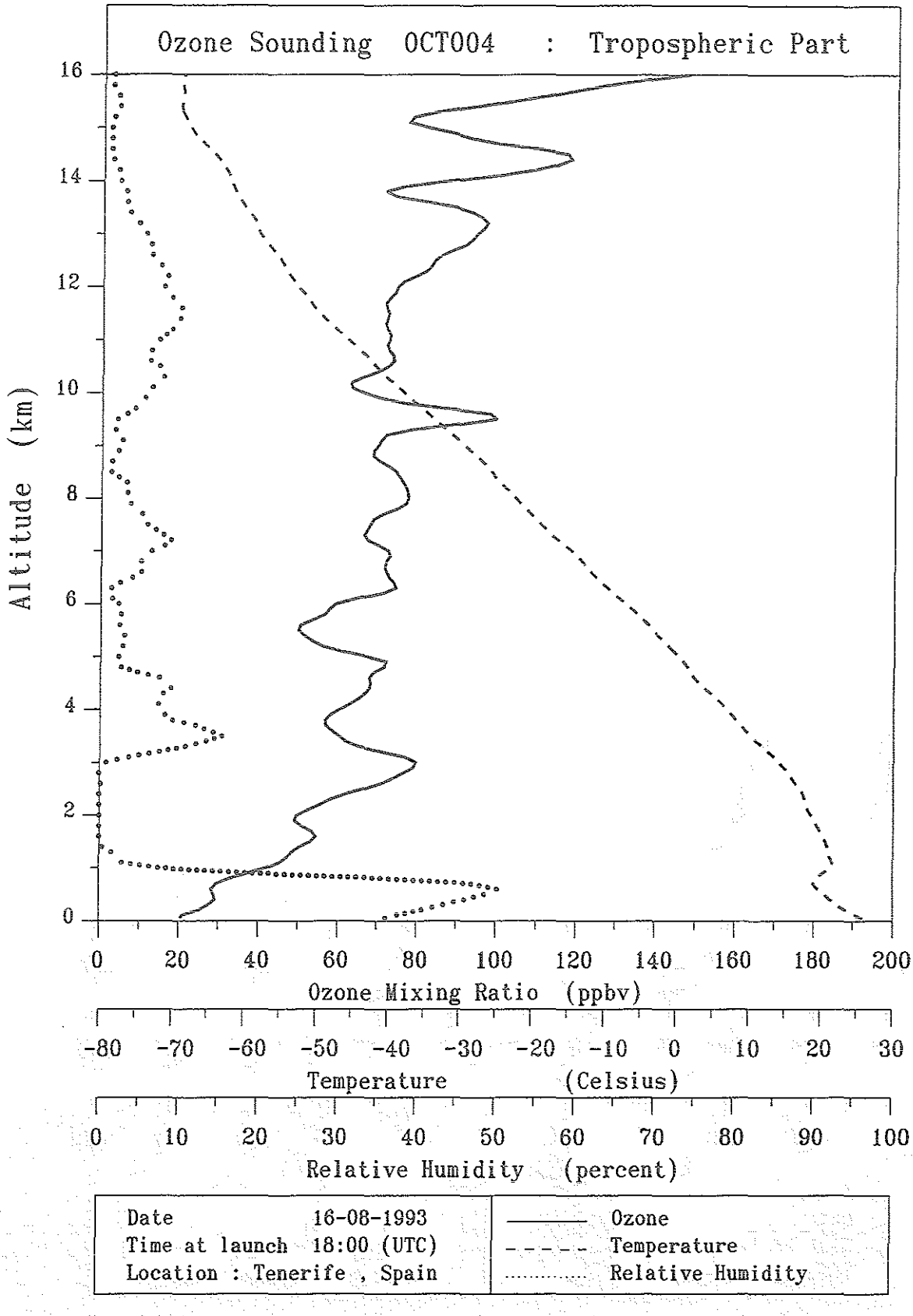

Ozone Sounding OCT002 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 16-08-1993
Time at launch 10:30 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

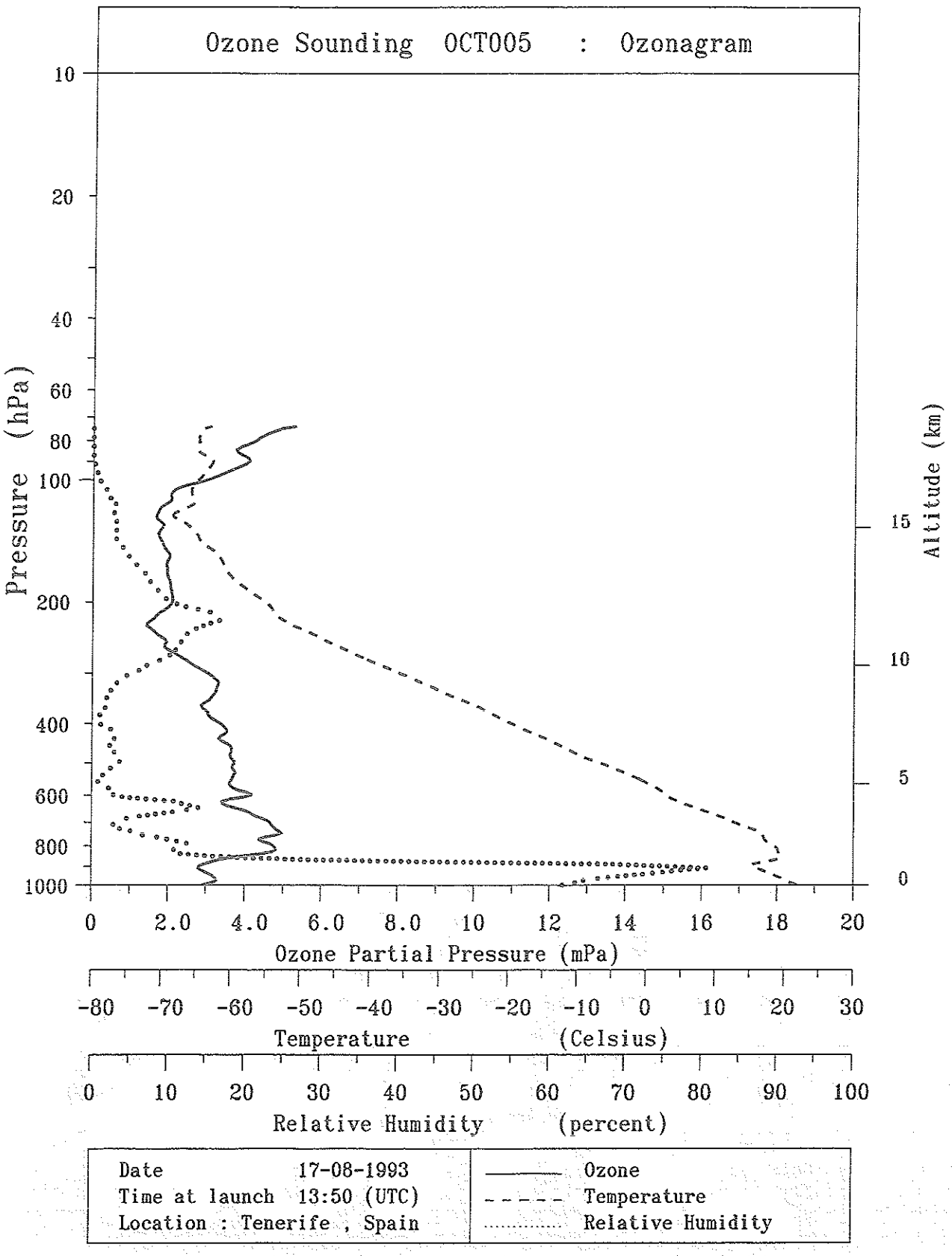

Ozone Sounding OCT002 : Tropospheric Part
Altitude (km)
16
14
12
10
8
6
4
2
0
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 16-08-1993
Time at launch 10:30 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

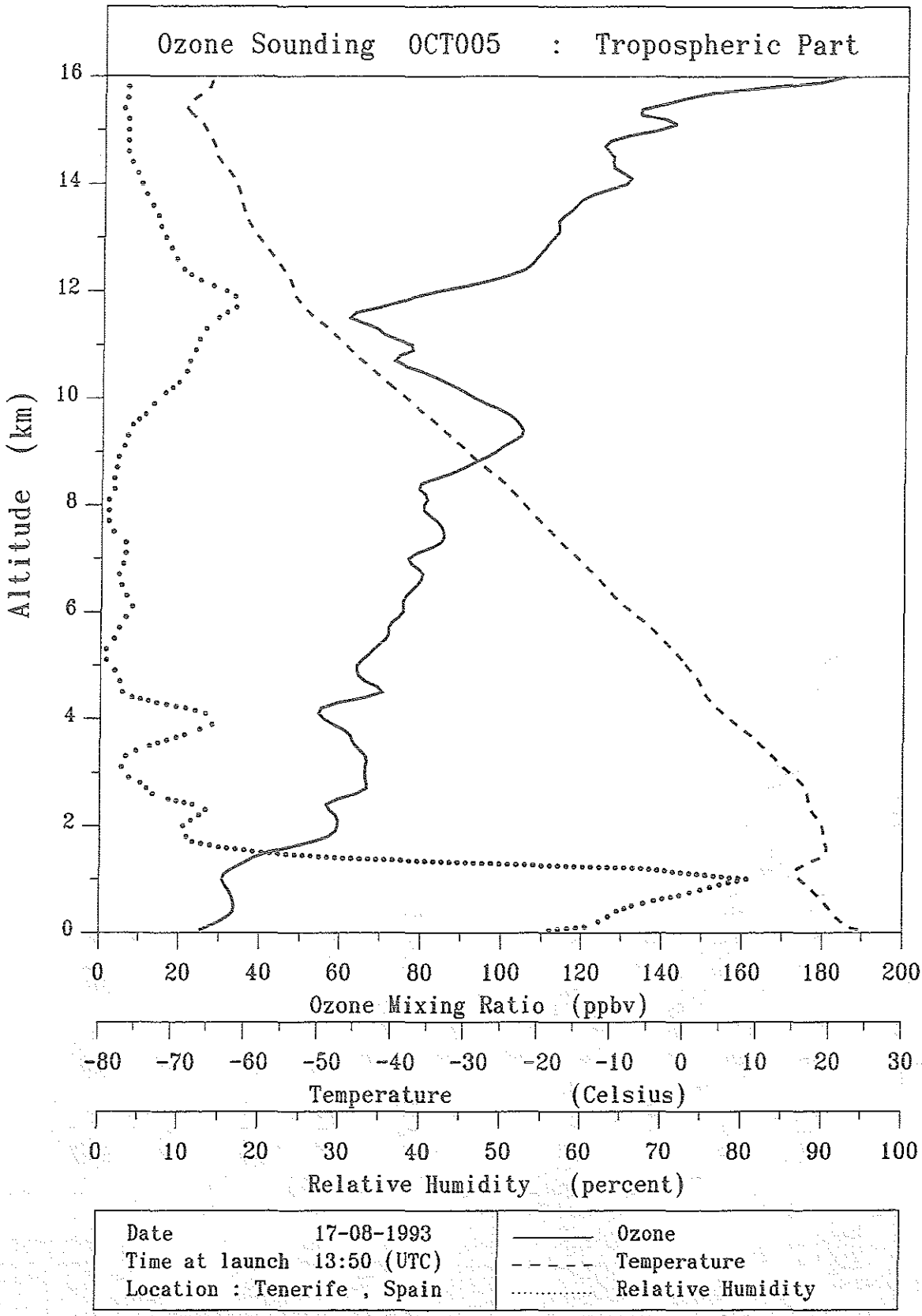

Ozone Sounding OCT003 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 16-08-1993
Time at launch 13:30 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

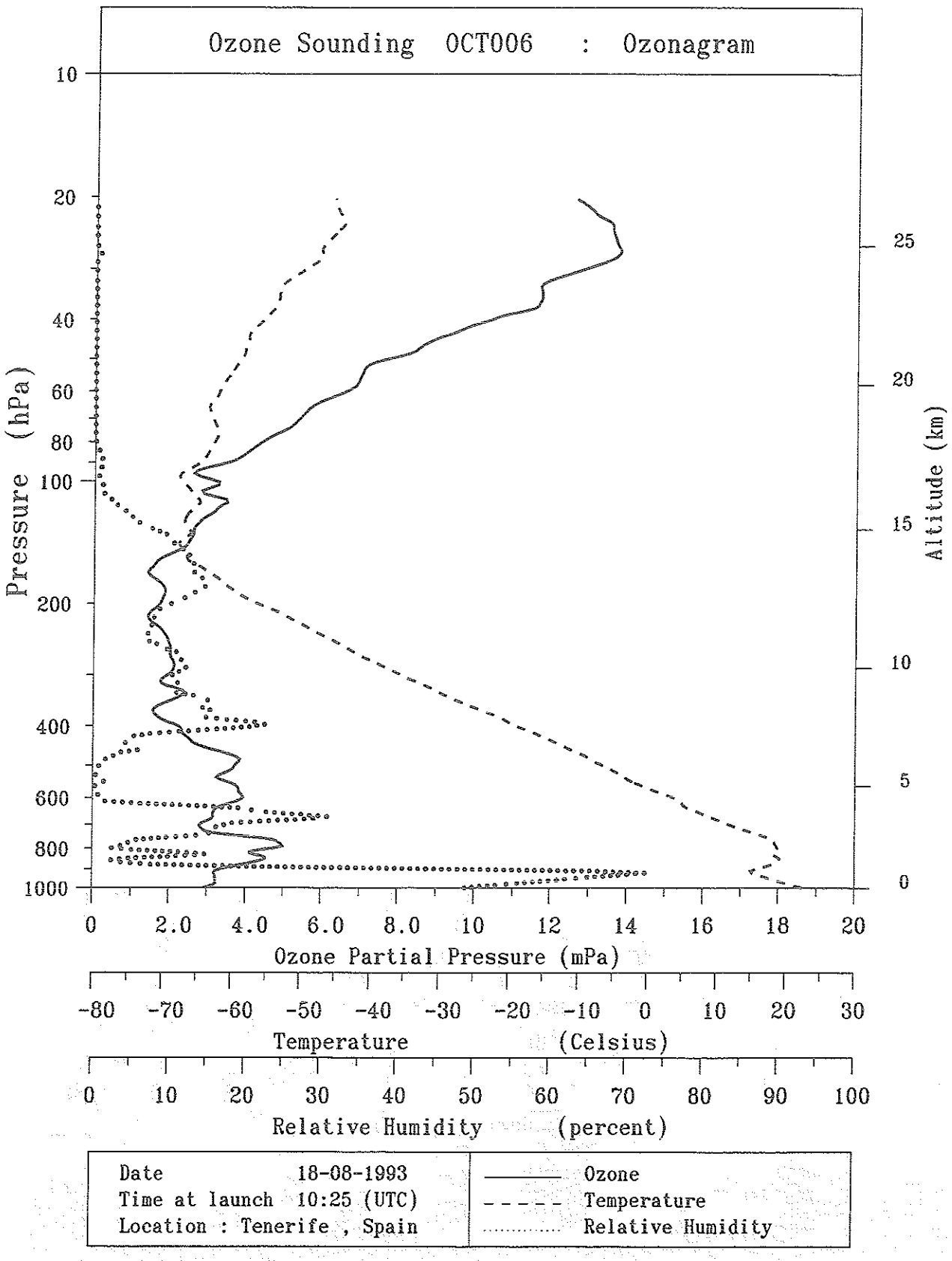

Ozone Sounding OCT003 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 16-08-1993
Time at launch 13:30 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

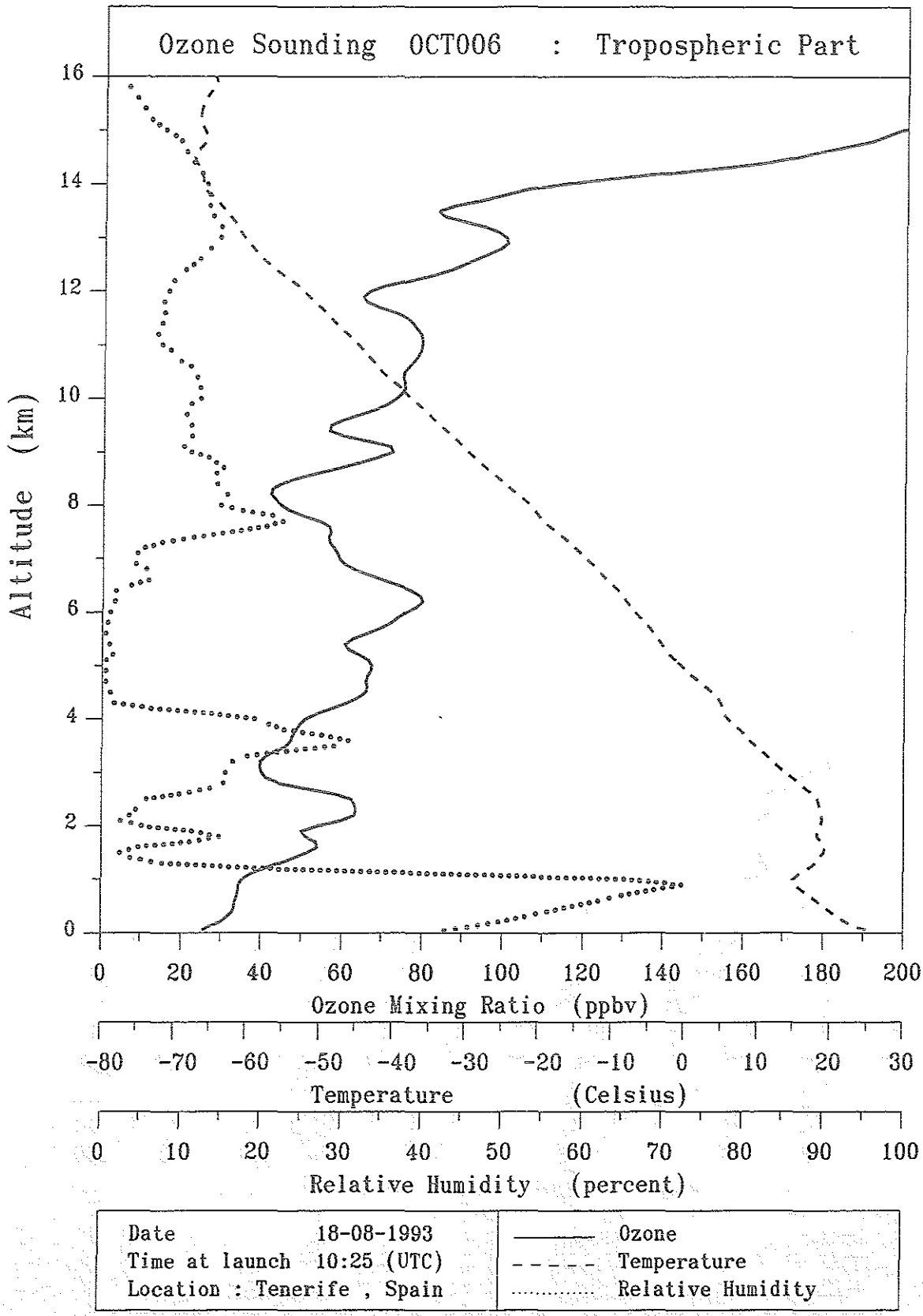

Ozone Sounding OCT004 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 16-08-1993
Time at launch 18:00 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

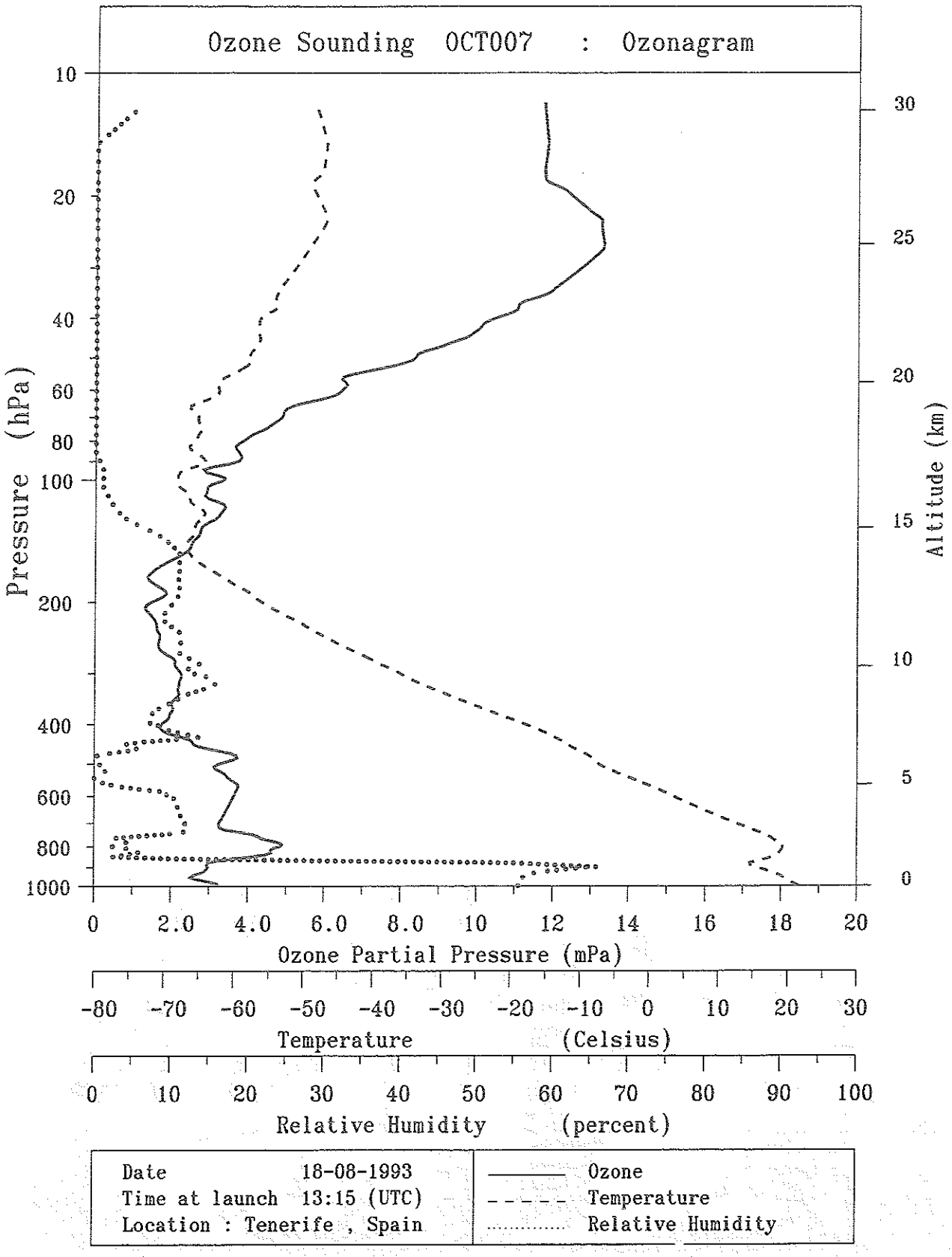

Ozone Sounding OCT004 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 16-08-1993
Time at launch 18:00 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

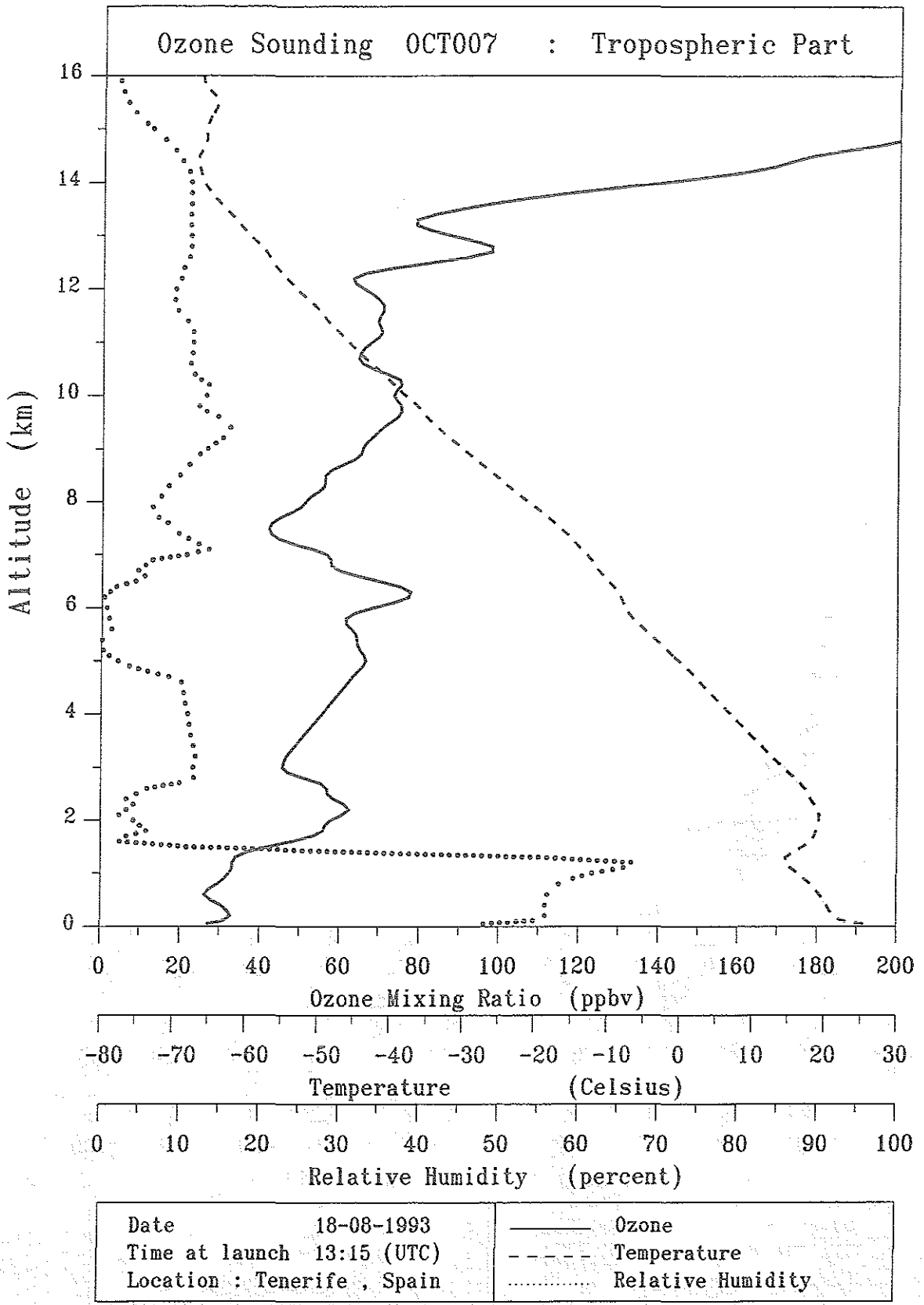

Ozone Sounding OCT005 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 17-08-1993
Time at launch 13:50 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

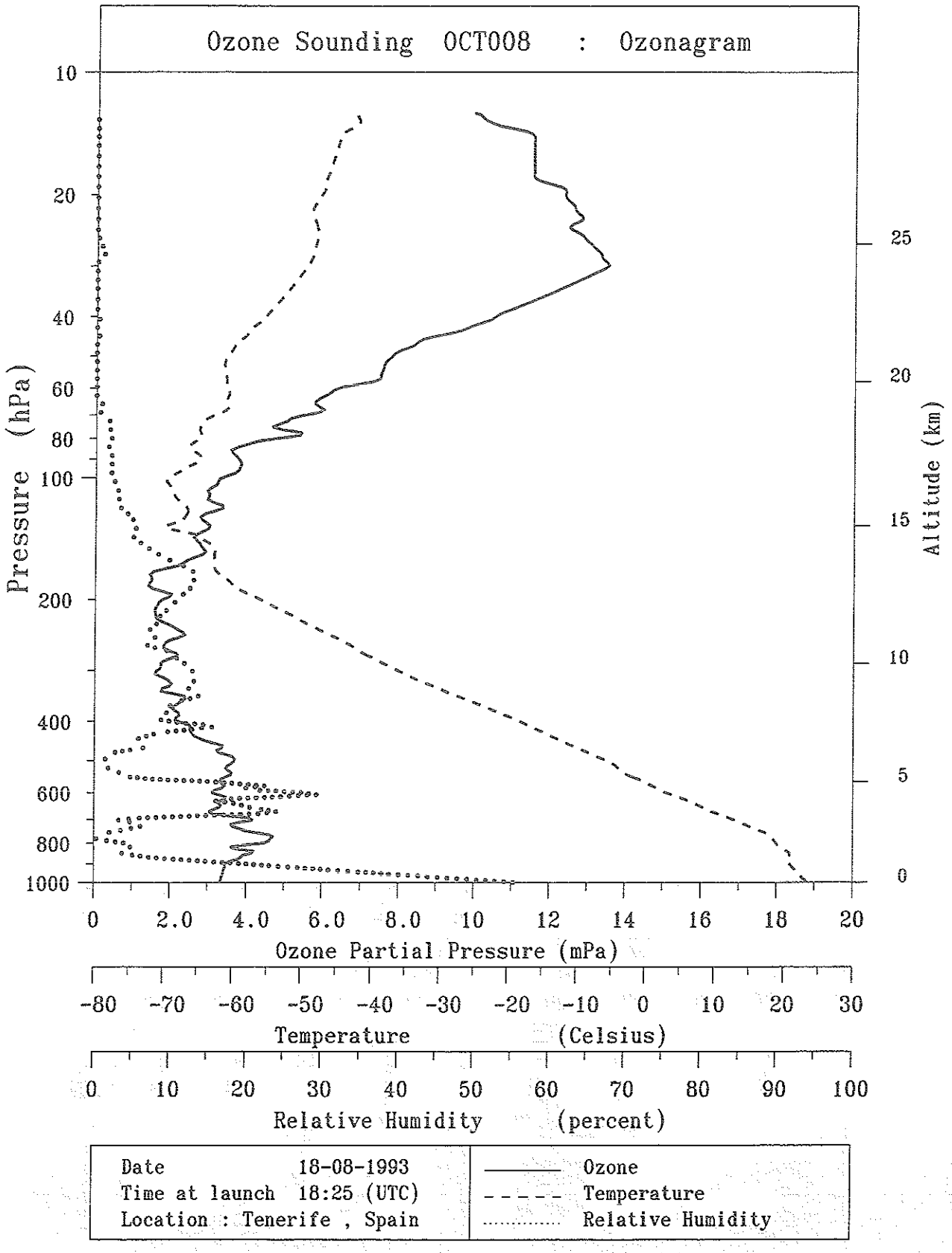

Ozone Sounding 0CT005 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 17-08-1993
Time at launch 13:50 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

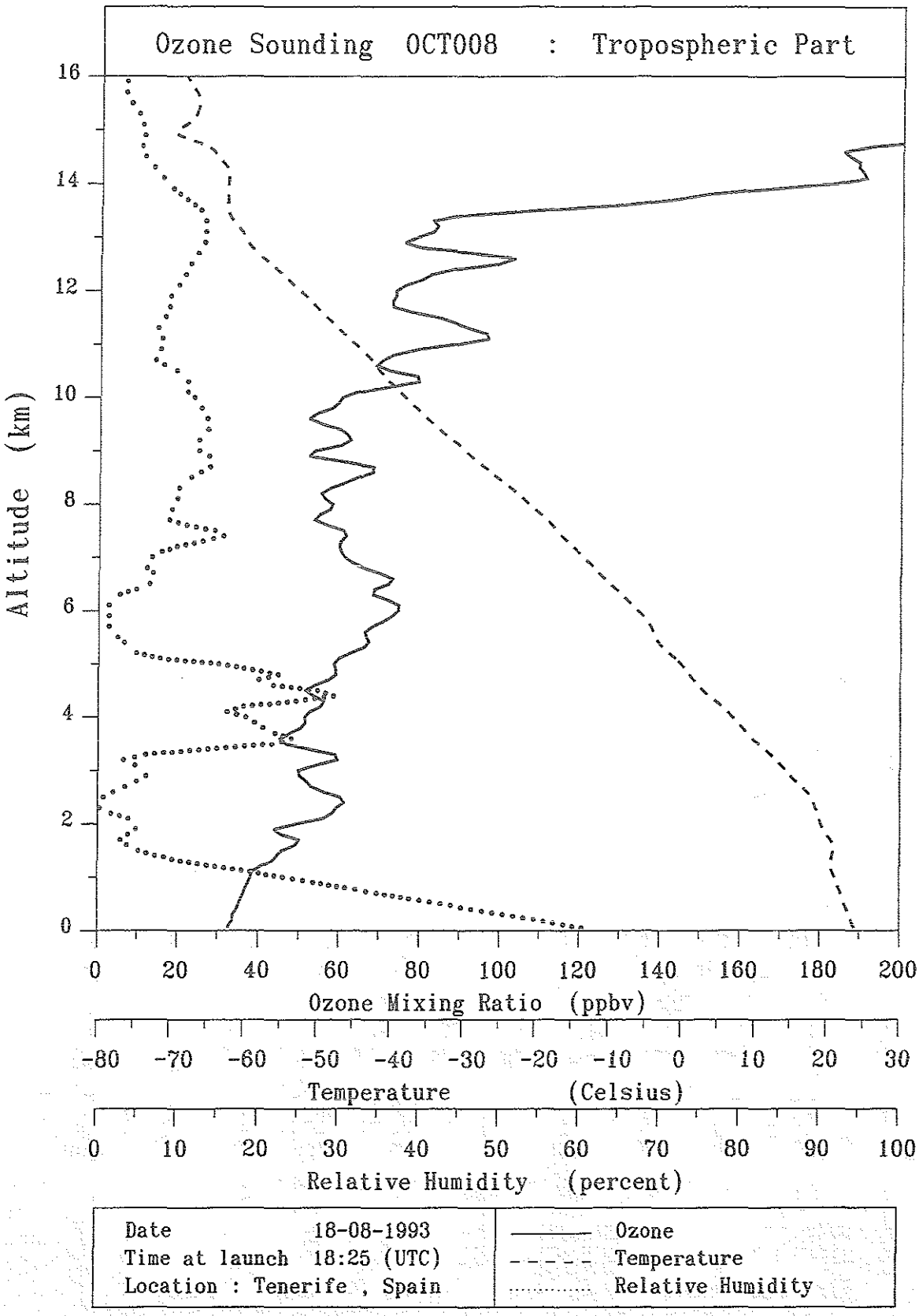

Ozone Sounding 0CT006 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 18-08-1993
Time at launch 10:25 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

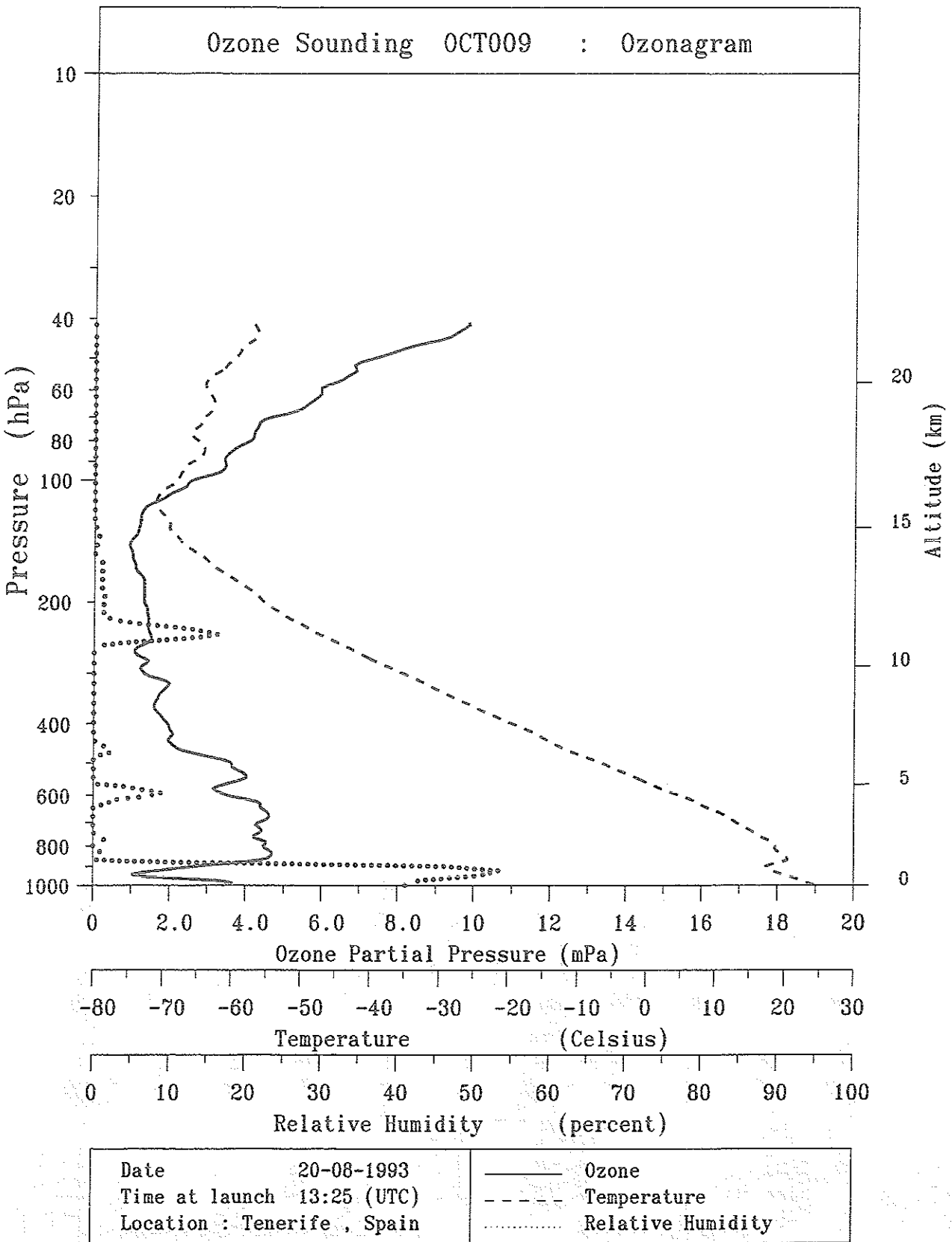

Ozone Sounding OCT006 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 18-08-1993
Time at launch 10:25 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

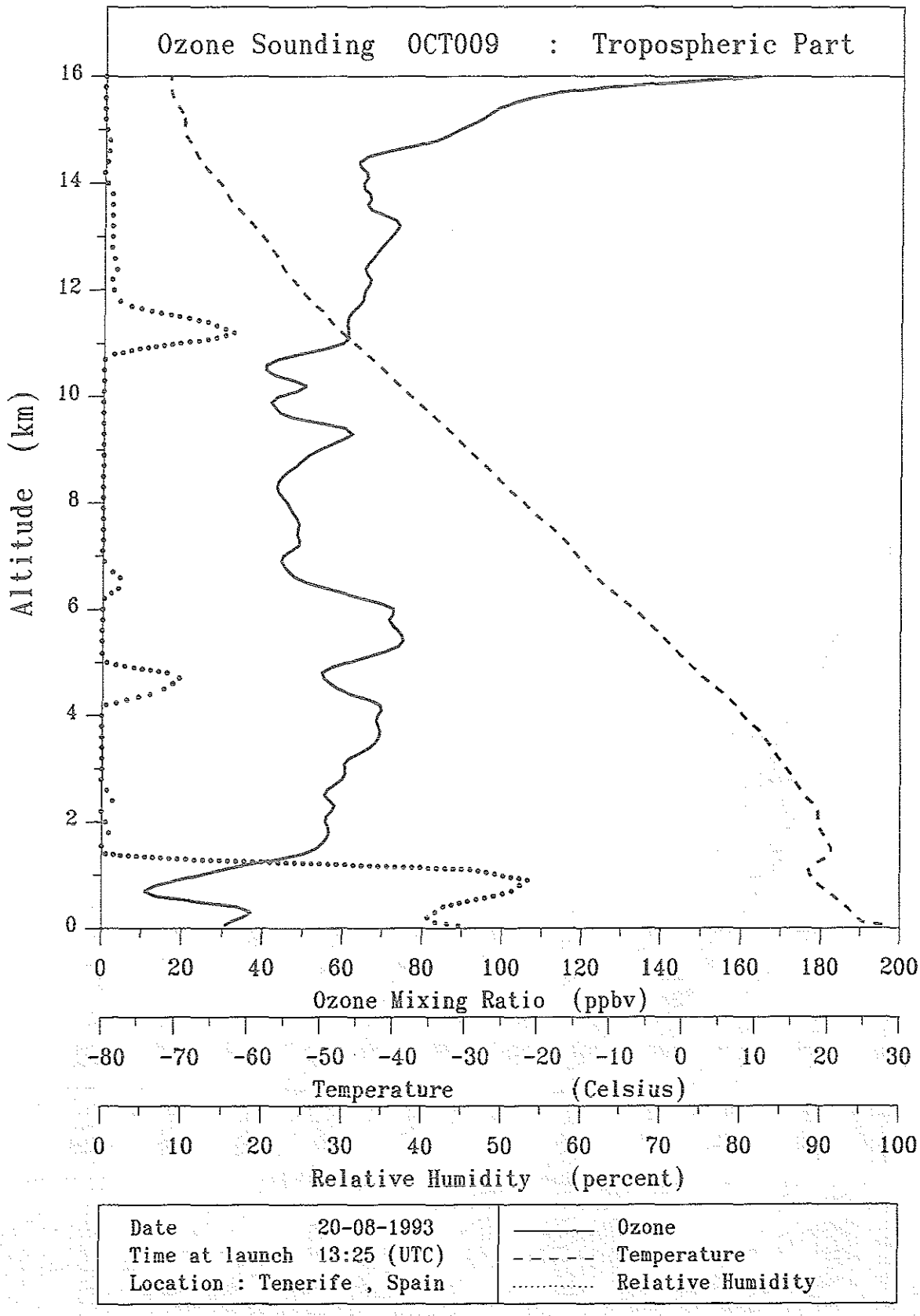

Ozone Sounding OCT007 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 18-08-1993
Time at launch 13:15 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

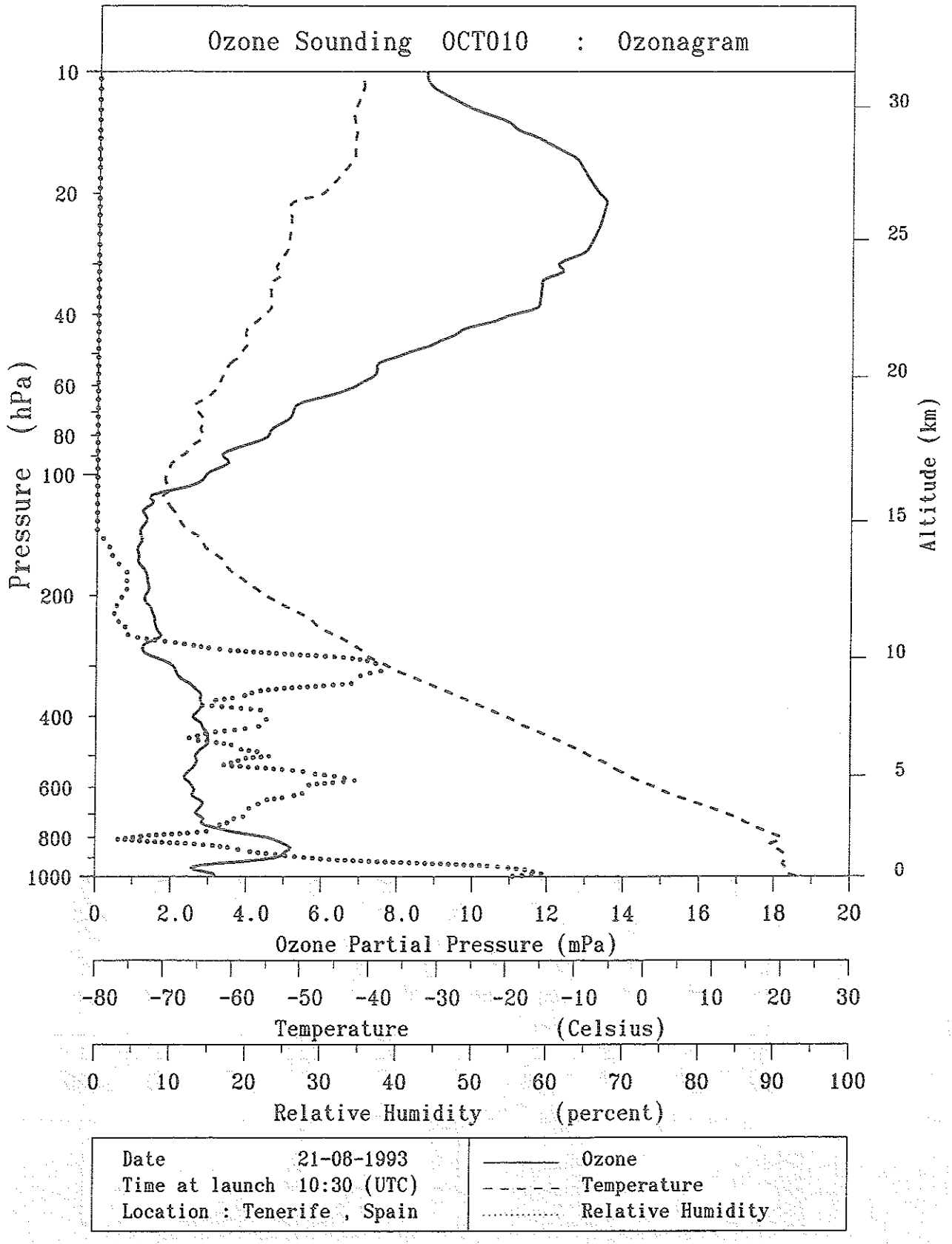

Ozone Sounding OCT007 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 18-08-1993
Time at launch 13:15 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

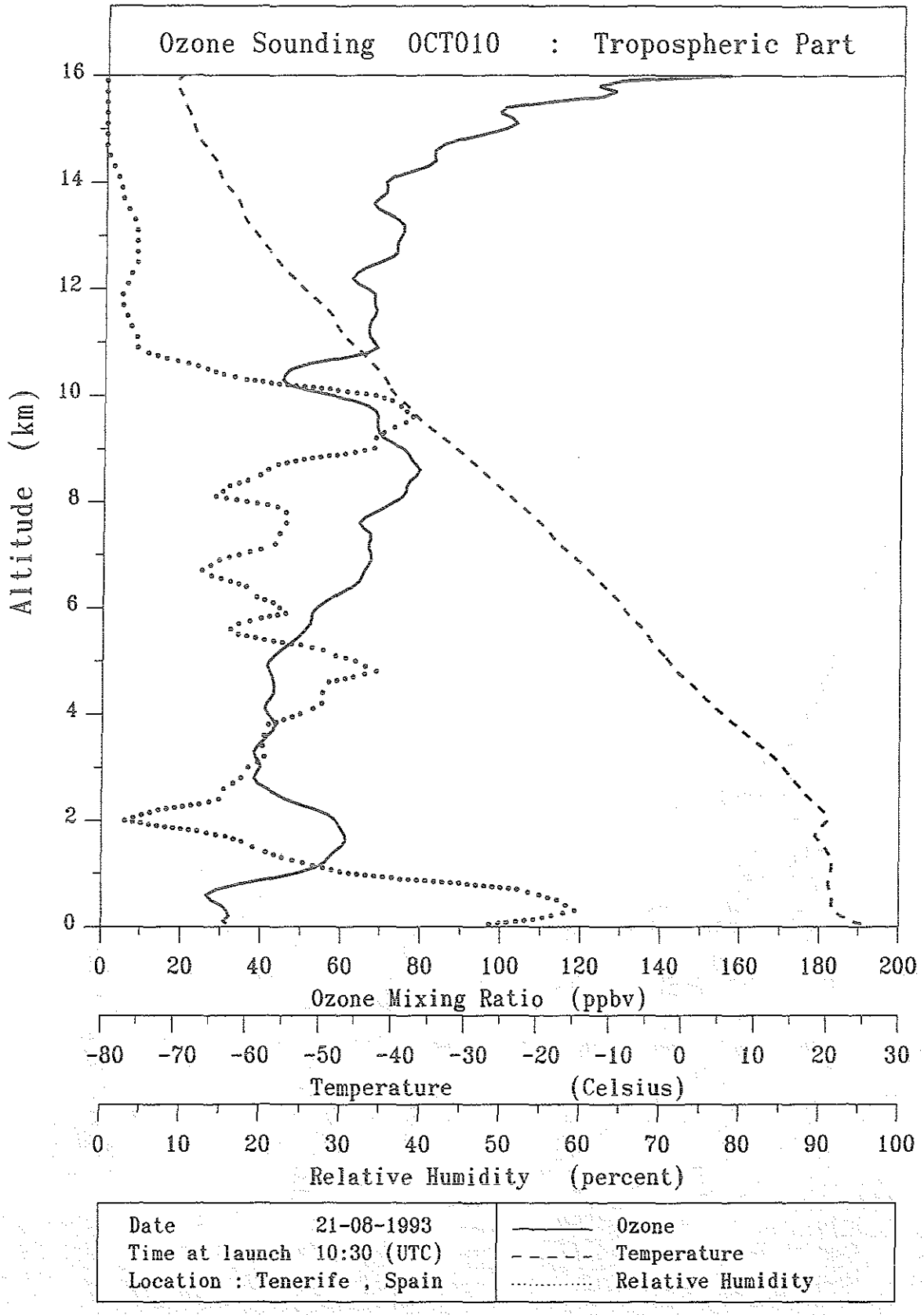

Ozone Sounding OCT008 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 18-08-1993
Time at launch 18:25 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

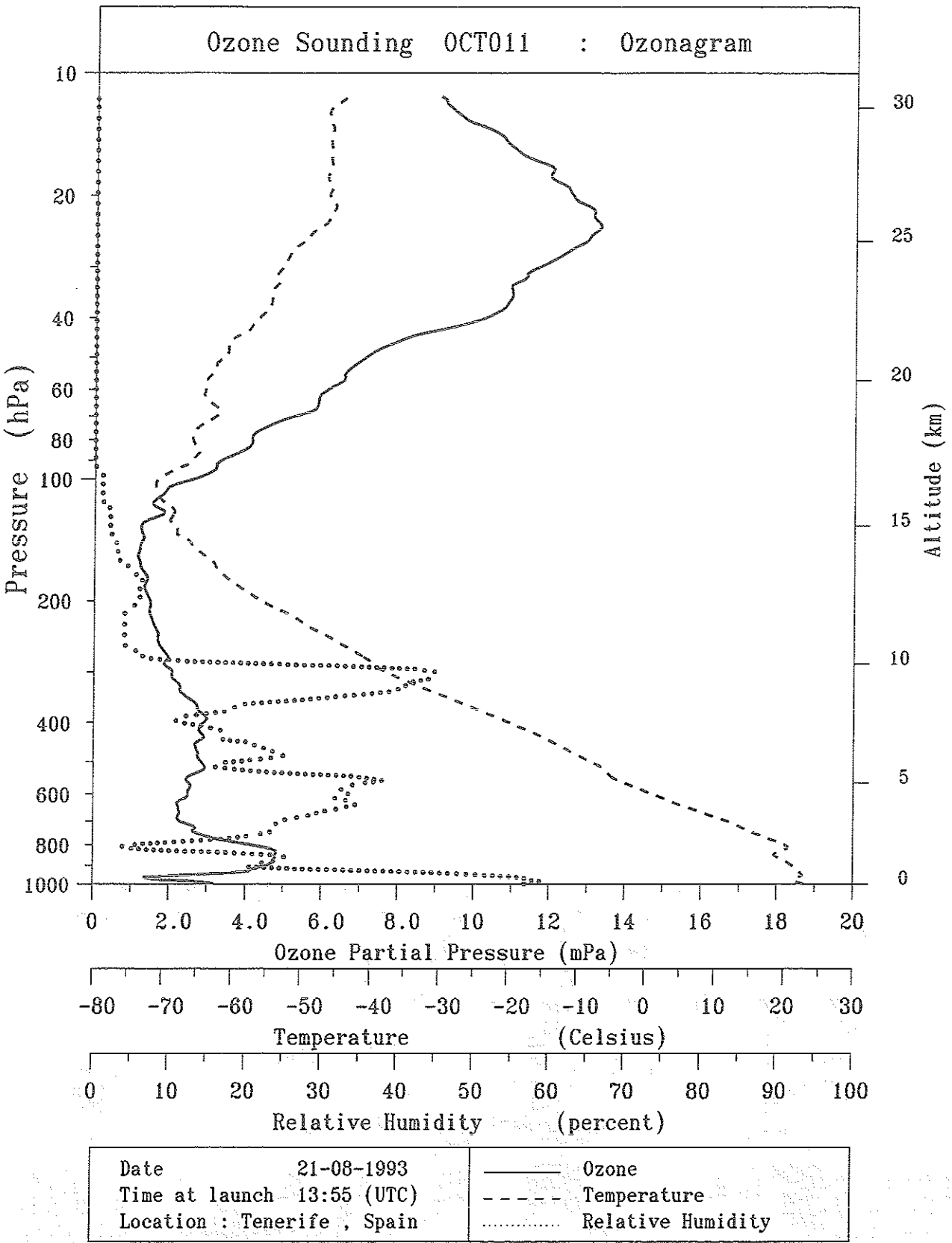

Ozone Sounding OCT008 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 16-08-1993
Time at launch 18:25 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

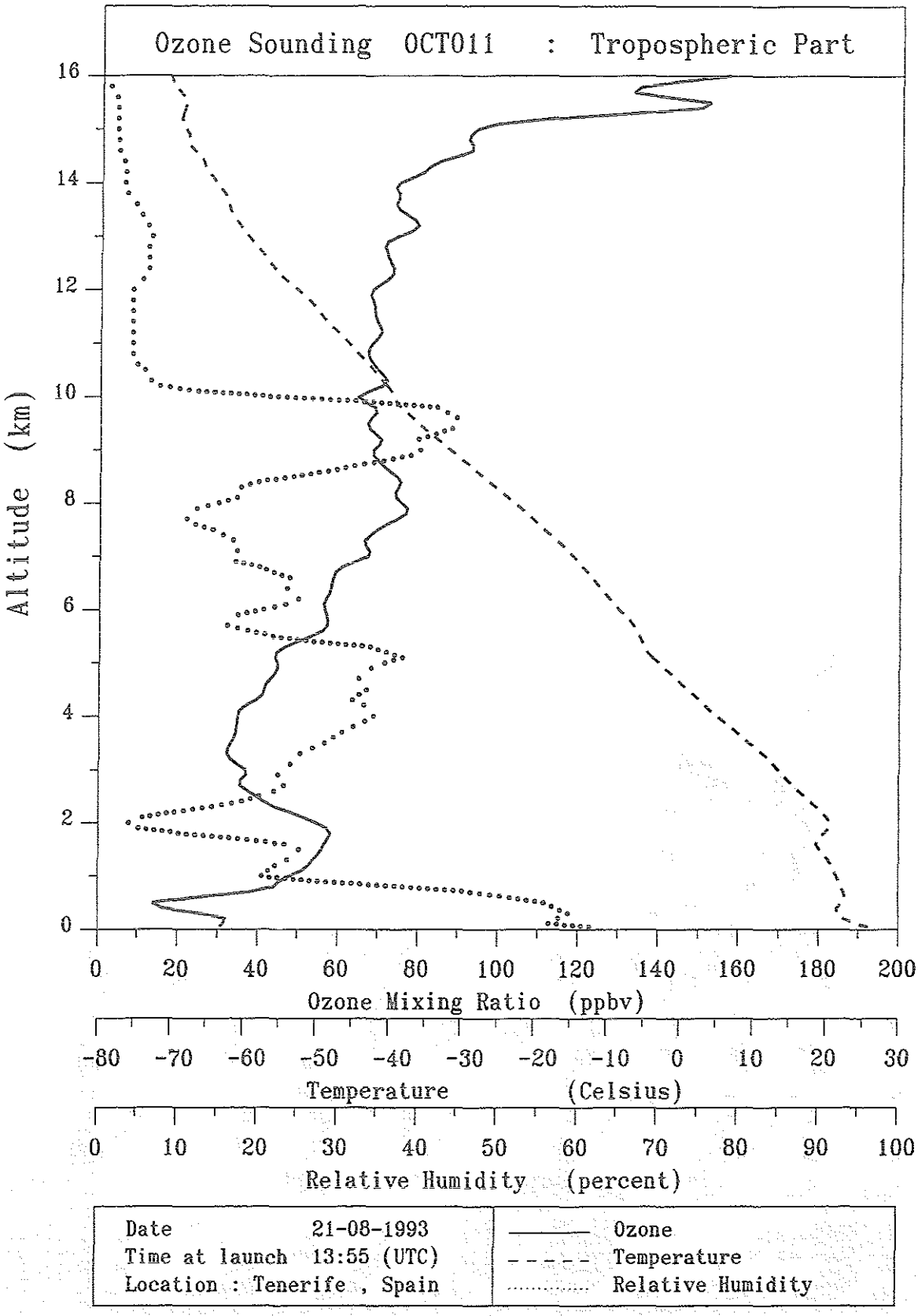

Ozone Sounding OCT009 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 20-08-1993
Time at launch 13:25 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

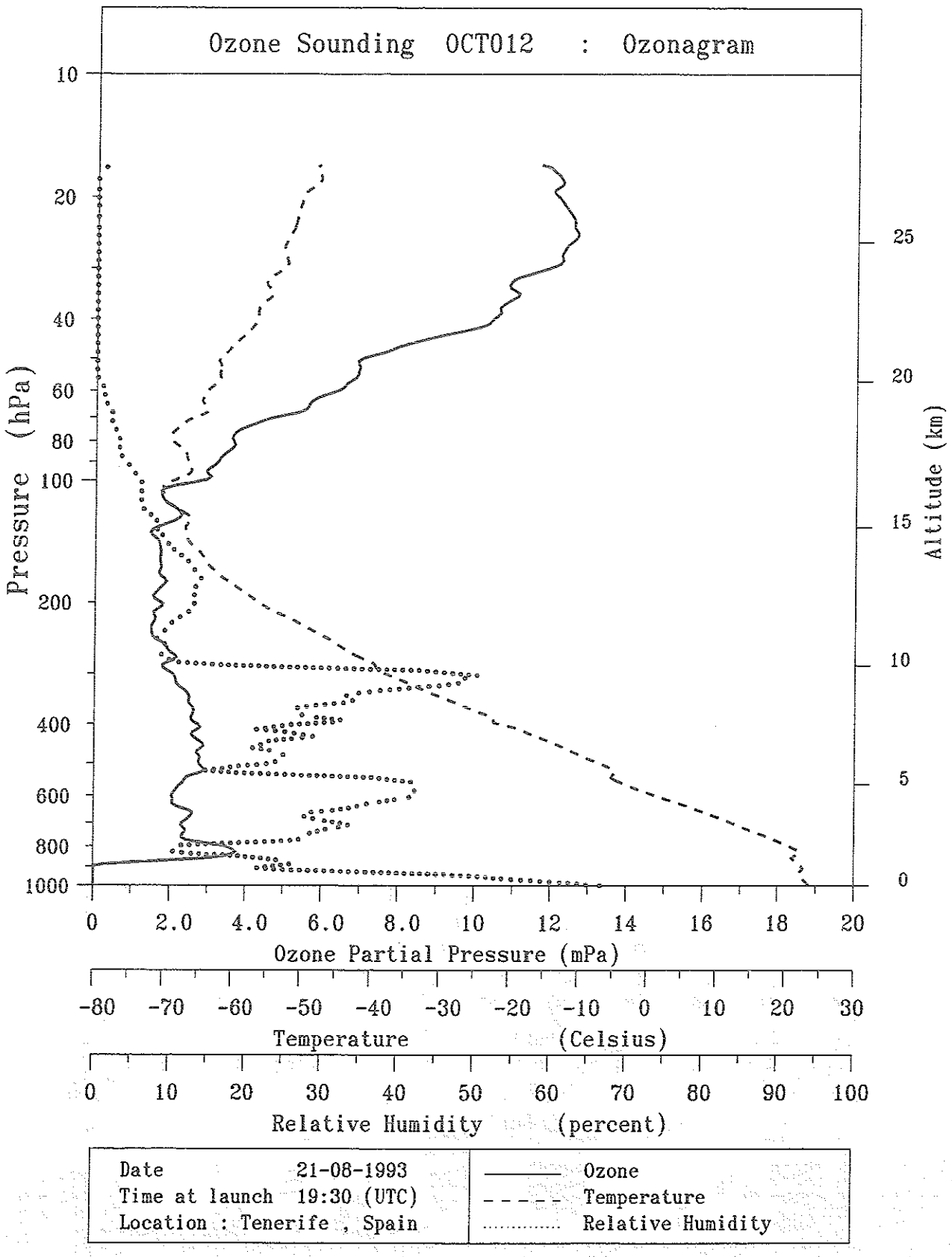

Ozone Sounding OCT009 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 20-08-1993
Time at launch 13:25 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

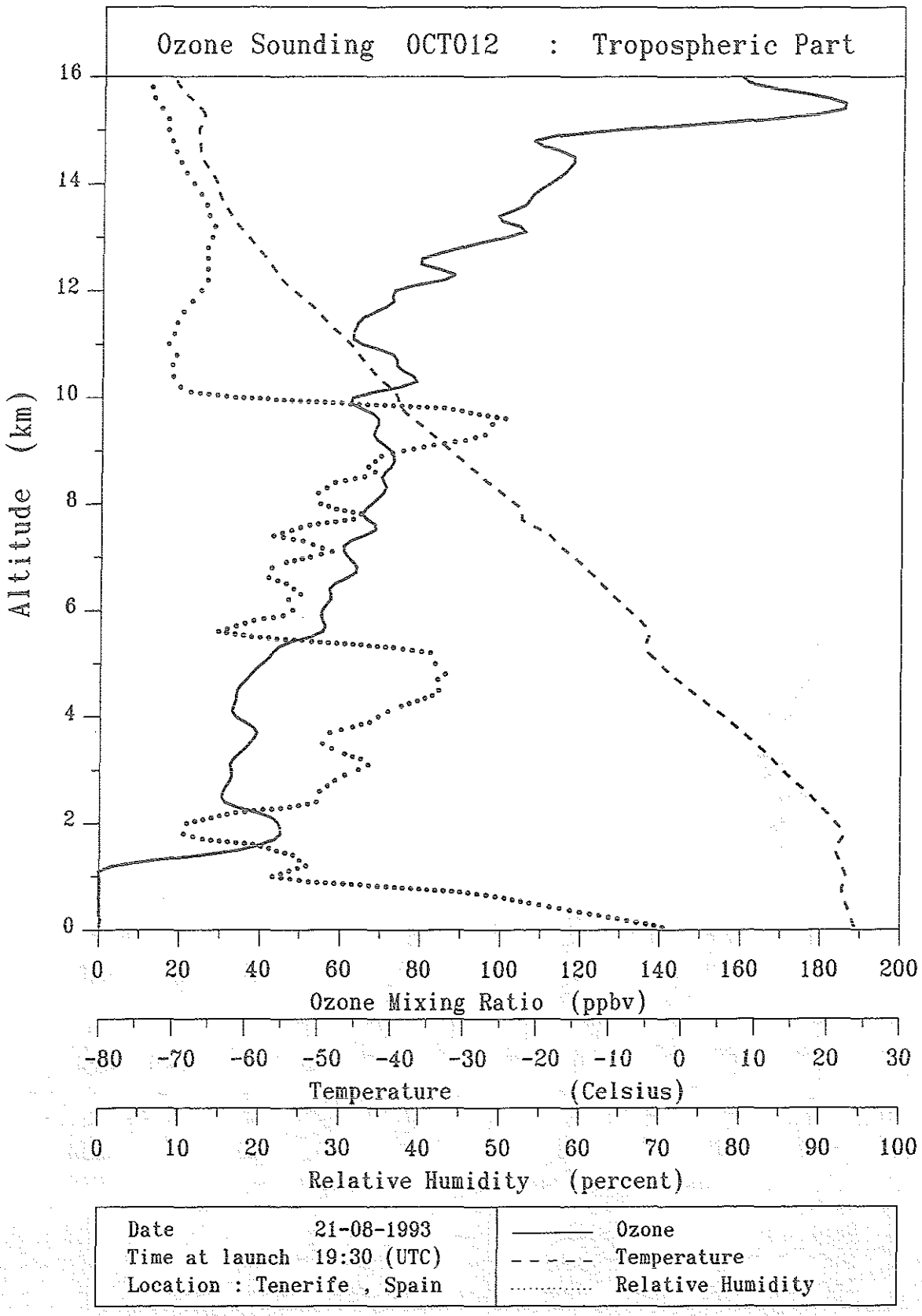

Ozone Sounding OCT010 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 21-08-1993
Time at launch 10:30 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

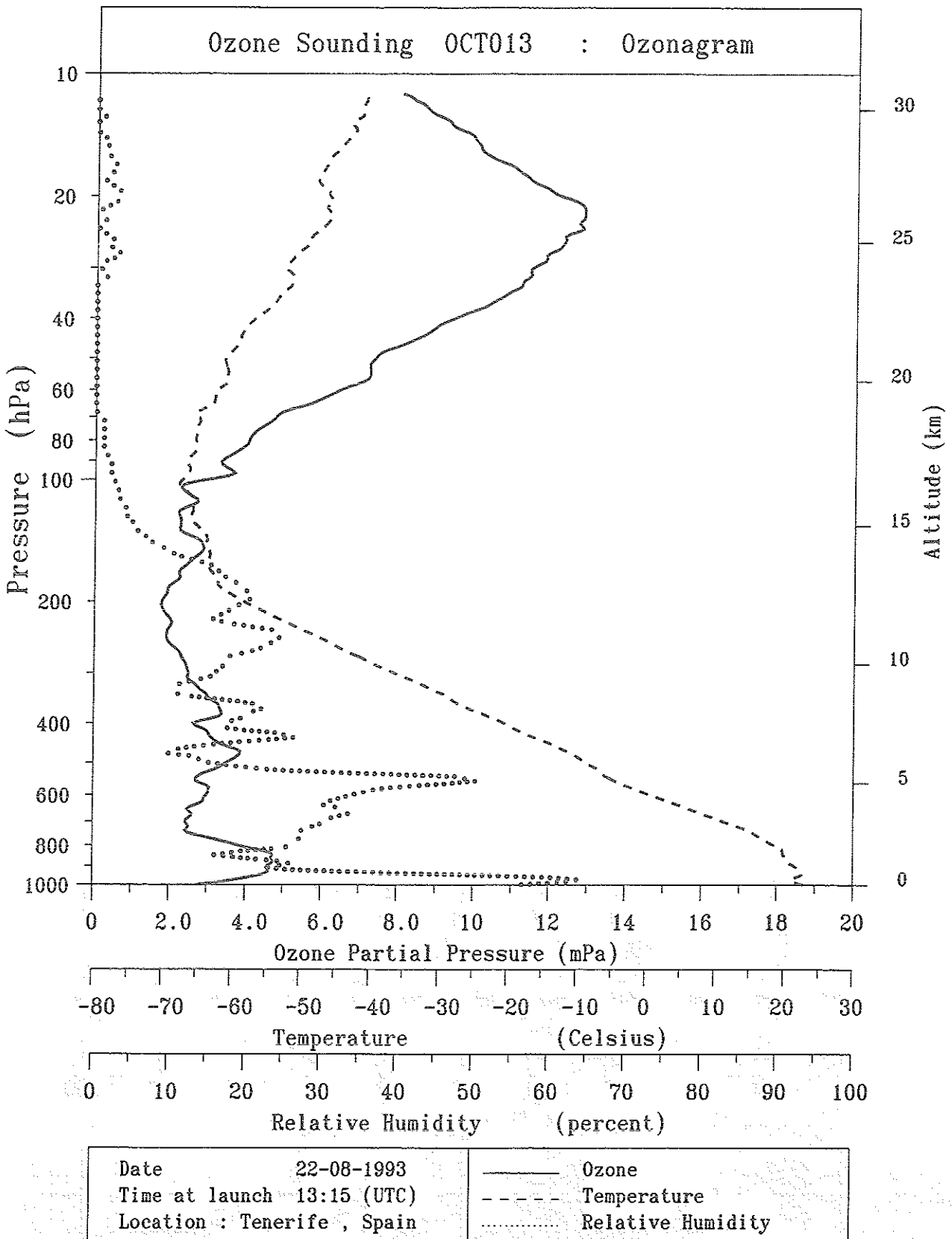

Ozone Sounding OCT010 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 21-08-1993
Time at launch 10:30 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

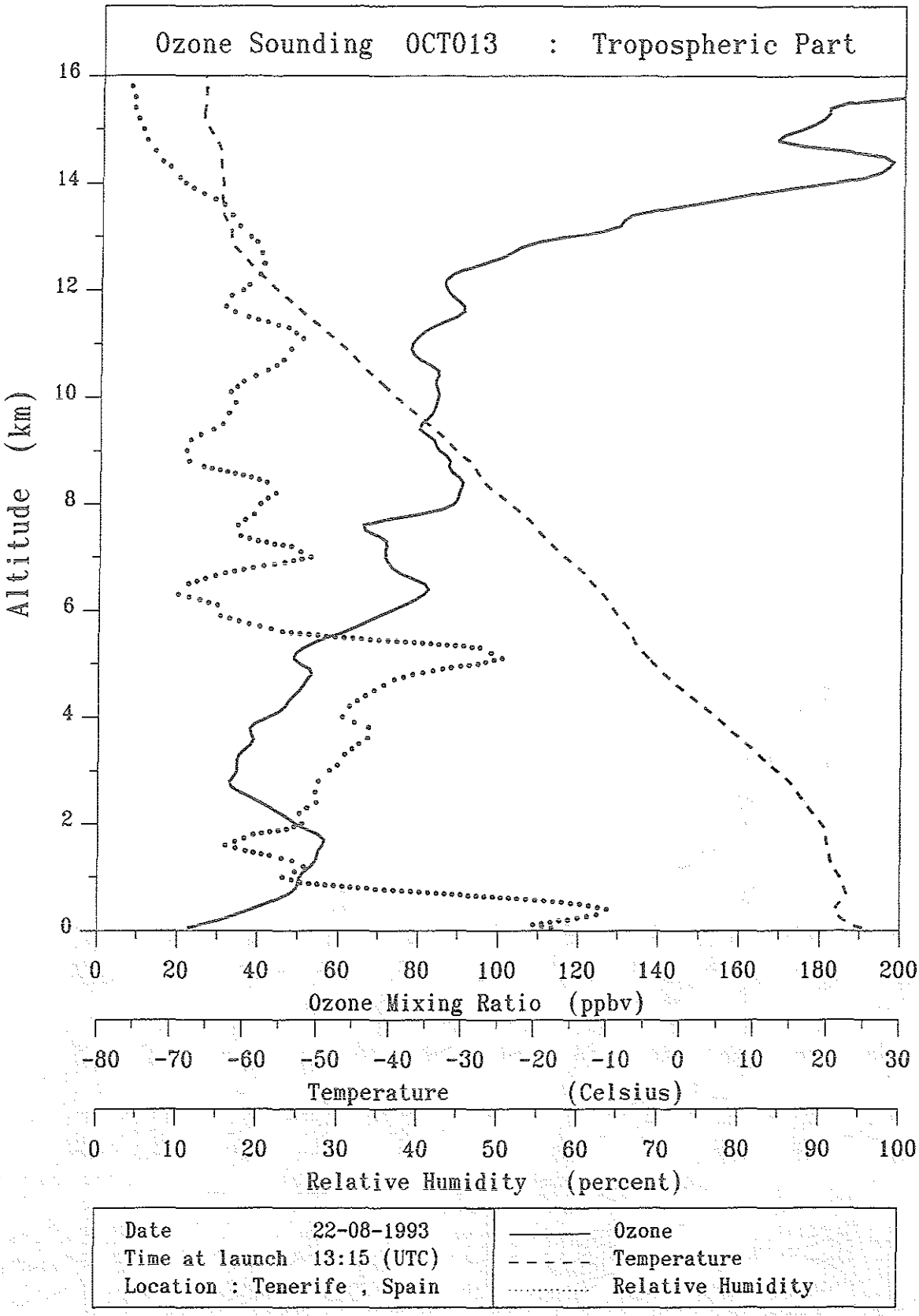

Ozone Sounding OCT011 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 21-08-1993
Time at launch 13:55 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

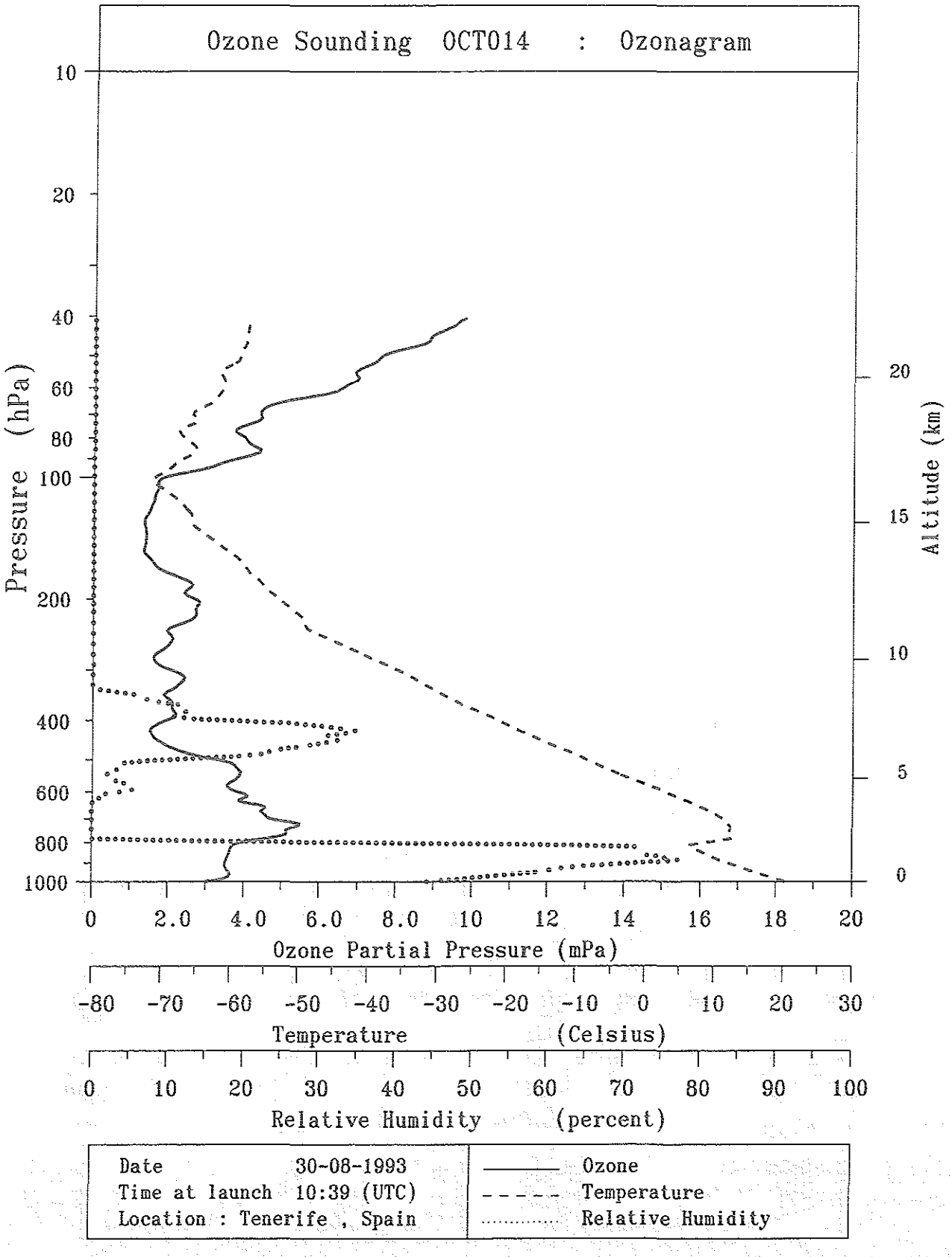

Ozone Sounding OCT011 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 21-08-1993
Time at launch 13:55 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

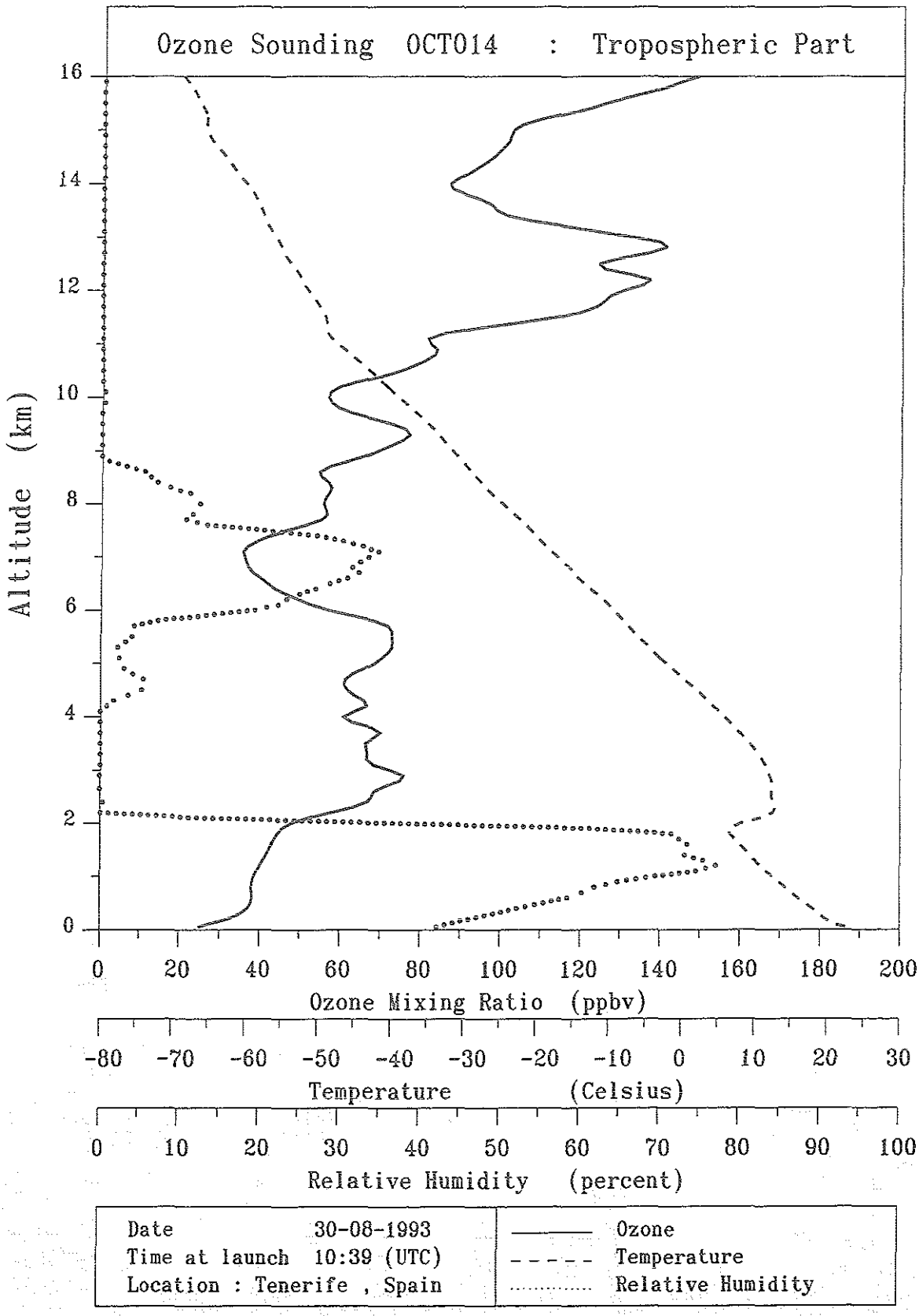

Ozone Sounding OCT012 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 21-08-1993
Time at launch 19:30 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity


Ozone Sounding OCT012 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 21-08-1993
Time at launch 19:30 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity


Ozone Sounding OCT013 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
30
25
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 22-08-1993
Time at launch 13:15 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity


Ozone Sounding OCT013 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 22-08-1993
Time at launch 13:15 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity


Ozone Sounding OCT014 : Ozonagram
Pressure (hPa)
10
20
40
60
80
100
200
400
600
800
1000
Altitude (km)
20
15
10
5
0
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20
Ozone Partial Pressure (mPa)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 30-08-1993
Time at launch 10:39 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity


Ozone Sounding OCT014 : Tropospheric Part
Altitude (km)
0
2
4
6
8
10
12
14
16
0 20 40 60 80 100 120 140 160 180 200
Ozone Mixing Ratio (ppbv)
-80 -70 -60 -50 -40 -30 -20 -10 0 10 20 30
Temperature (Celsius)
0 10 20 30 40 50 60 70 80 90 100
Relative Humidity (percent)
Date 30-08-1993
Time at launch 10:39 (UTC)
Location : Tenerife , Spain
Ozone
Temperature
Relative Humidity

FORSCHUNGSZENTRUM JÜLICH GmbH

KFA

Jül-3078
June 1995
ISSN 0944-2952