The BOUSSOLE project technical reports; report #7-7, issue 1.

BOUSSOLE buoy deployment & maintenance log. June 10, 2006 – February 12, 2007

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BOUSSOLE project

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Foreword

This report is part of the technical report series that is being established by the BOUSSOLE project.

BOUSSOLE is funded/supported by the following Agencies, Institutions or Programs

European Space Agency

Centre National d'Etudes Spatiales, France

National Aeronautics and Space Administration of the USA

Centre National de la Recherche Scientifique, France

Institut National des Sciences de l'Univers, France

Université Pierre & Marie Curie, France

Observatoire Océanologique de Villefranche sur mer, France

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1. SCOPE OF DOCUMENT

The BOUSSOLE buoy deployment and maintenance log is a record of all events that occur from the deployment to the recovery of one of the two upper sections of the buoy.

The aim is to keep track of all maintenance operations, such as instruments cleaning or rotations, instruments malfunctions, incidents with the buoy structure, if any, biofouling development and so on.

This information is crucial to a subsequent correct interpretation of the data.

Keeping track of these events also allows their analysis in view of the permanent improvement of protocols.

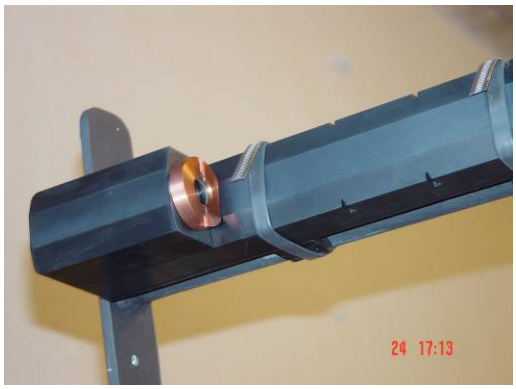
The present report concerns "buoy deployment 4", from June 10 of 2006 to February 12 of 2006.

2. DESCRIPTION OF OPERATIONS

2.1 UPPER SECTION PREPARATION (2006-01)

The Buoy was again prepared in the CCI local in Villefranche-Sur-Mer, and again the preparation was without any surprise thanks to the experience of the previous deployments. Copper sheets and pieces were again fixed wherever possible to avoid biofouling arising (see pictures).






2.2 MOORING DEPLOYMENT

2.2.1 Saturday 10th June 2006

The new upper structure of the buoy was brought to the "Rochambeau" lot at 07am with the help of about 10 people from the LOV. One hour later, the 4 arms were assembled and connected to the buoy, and the Rochambeau lot was a little bit cleaned (at least some tarpaulins were put on some light and volatile detritus clusters) and the helicopter pilot was called to fetch the buoy a few minutes before 09am.

One hour later, the helicopter brought back the ancient buoy that was disassembled by SAMAR divers on the preceding day. All the exchange operations were performed without any problem.





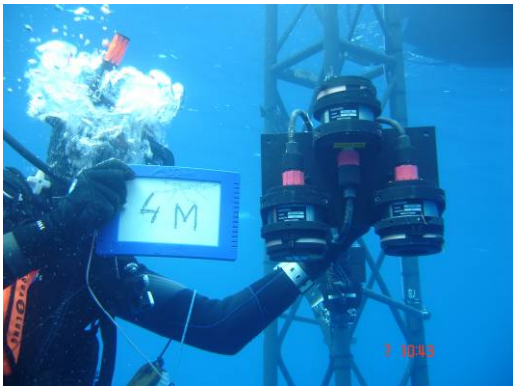


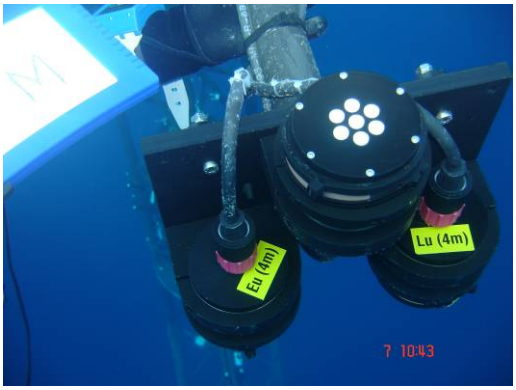

At this date, buoy is equipped with

- **DACNet #1**
- **Boussole's rads set (OCI s/n 165, 166, 167, 168, 169 and OCR s/n 107 and 108), MVDS009, OCP038 and OCP039**
- **HS2 #2021045**
- **No strain sensor**
- **Transmissionmeter C-Star #746PR (4m) and #747PR(9m)**
- **Fluorometer #175265 (4m) and #175266 (9m)**
- **ARGOS beacon #26021**
- **CTD 37SI-33984-3006**

2.2.2 Friday 07th July 2006

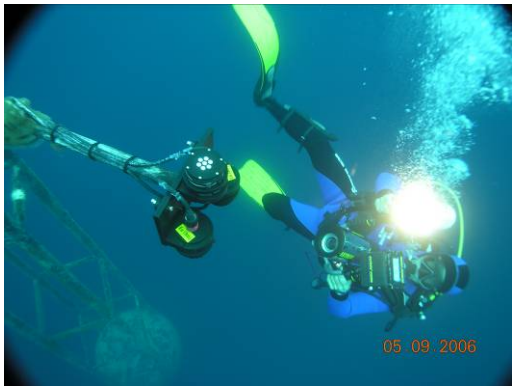
This day is part of the BOUSSOLE 55 mission. Divers checked the buoy structure and sensors state under the sea surface, and cleaned the optical surface of the instruments.

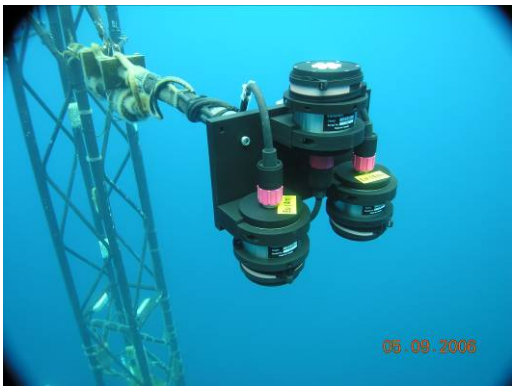


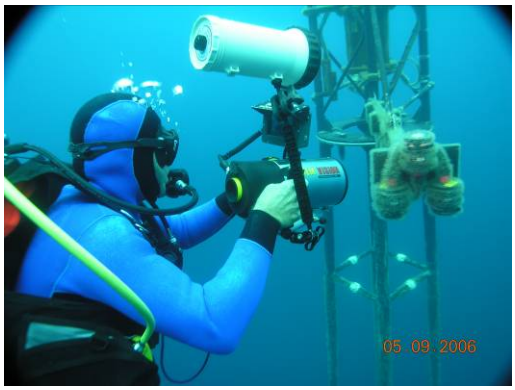


2.2.3 Tuesday 5th September 2006

This day is part of the BOUSSOLE 56 mission. Divers checked the buoy structure and sensors state under the sea surface, and cleaned the optical surface of the instruments.







2.2.4 Friday 6th October 2006

This day is part of the BOUSSOLE 57 mission. Divers checked the buoy structure and sensors state under the sea surface, and cleaned the optical surface of the instruments.

2.2.5 Tuesday 7th November 2006

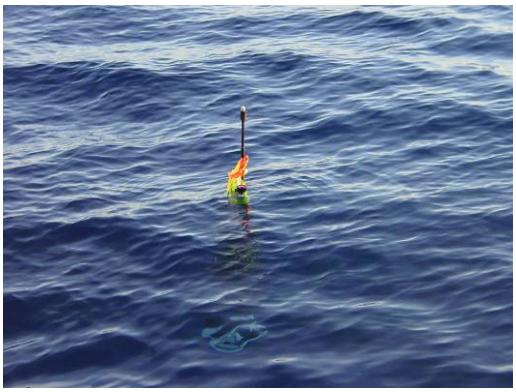
This day is part of the BOUSSOLE 58 mission. Divers checked the buoy structure and sensors state under the sea surface, and cleaned the optical surface of the instruments.

As the buoy had stopped recording data and communication since Saturday 21st October, 2006, the DACNet was disassembled from the buoy and brought back on the ship deck. After a simple connection to a laptop when powered by a power supply (in the ship lab), the DACNet was found to work properly, and was immediately reassembled on the buoy.

The problem was sought on the side of the buoy power supply, i.e. the battery + CLC + Junction Box + solar panels set. After inspection of the Junction Box with a voltmeter, it appeared that

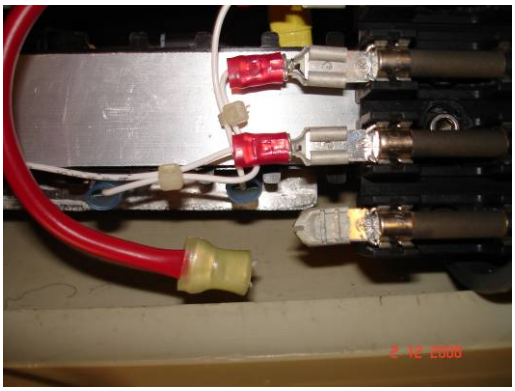
power arrived from solar panels but wasn't transmitted to the CLC, as no signal was recorded at the output of the Junction Box.

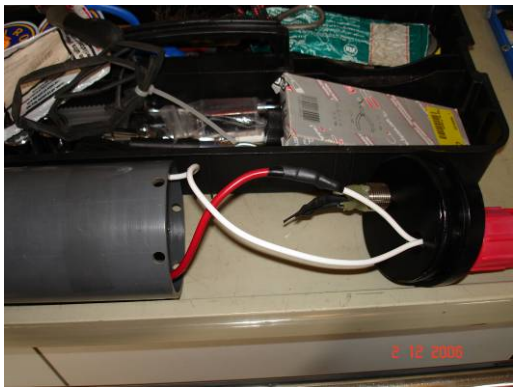
Unfortunately, the weather conditions roughened suddenly, and the Junction Box couldn't either be brought back to the LOV or in the ship lab for inspection.



2.2.6 Saturday 2nd December 2006

This day is part of the BOUSSOLE 59 mission. Divers checked the buoy structure and sensors state under the sea surface, and cleaned the optical surface of the instruments. The Junction Box could this time be brought back in the ship lab, and it was found that an electric pod inside the Box was broken (unfortunately the ground pod, so that no solar panels could power the battery via the CLC). The pod was shortcut, and so was the magnetic rotary switch of the Junction Box, as it was found to be a little bit jammed (especially the same switch was broken on the buoy battery few weeks before). Few hours after the Junction Box had been reassembled on the buoy, the data recording began again.

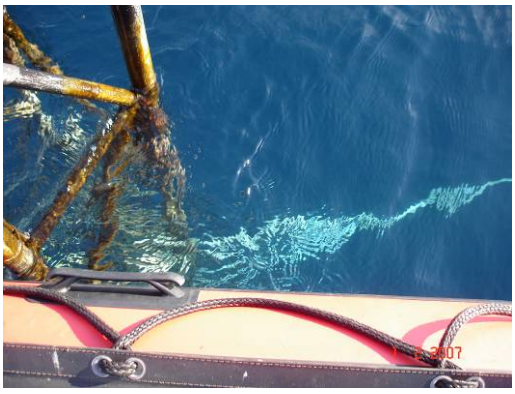




2.2.7 Monday 5th February 2007

This day is part of the BOUSSOLE 60 mission. Divers checked the buoy structure and sensors state under the sea surface, and cleaned the optical surface of the instruments.

The antifouling paint of the buoy began to be used up.



2.2.8 Thursday 22nd February 2007

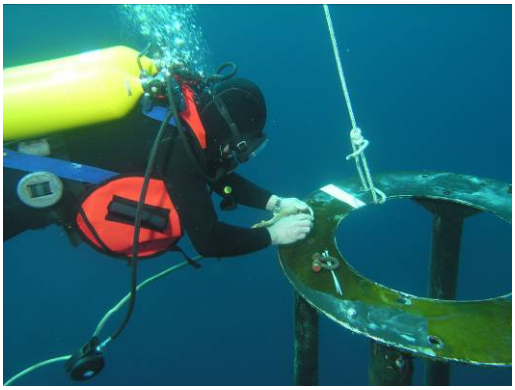
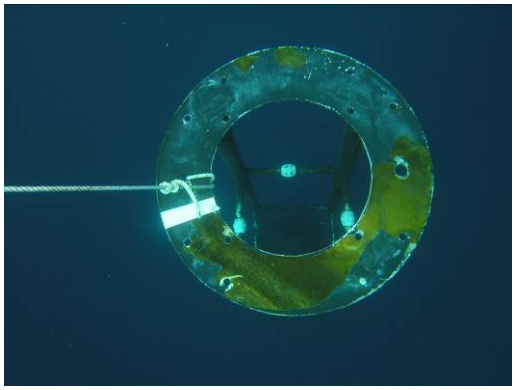
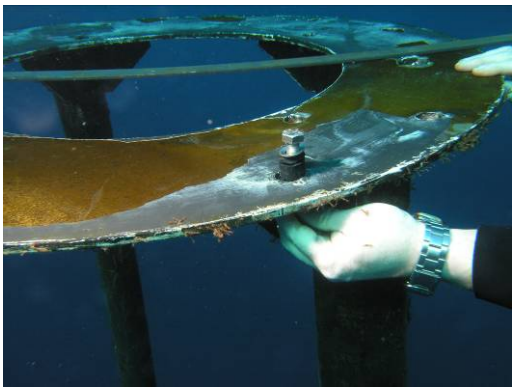
This day is part of the BOUSSOLE 61 mission. The buoy stopped ARGOS communication since Monday 12th February, 2007 (a day were the wind and the swell were very strong). No mission could have been organized due to bad weather continuing from this date until the BOUSSOLE servicing cruise number 61.

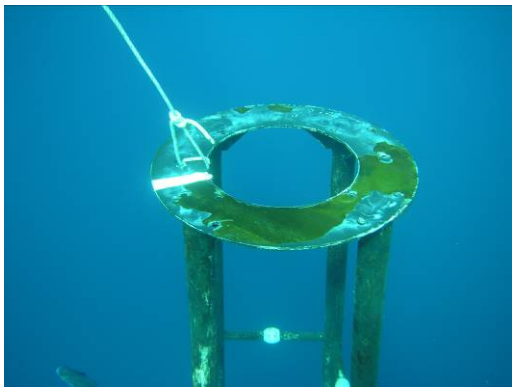
When arriving at the BOUSSOLE site, the buoy was not found. As the weather was rather windy (20 knots), the ship stayed around the BOUSSOLE point (at about 500 meters, to avoid striking the head of the buoy if present and a few meters below the sea surface) for more than one day, waiting the buoy to emerge. Unfortunately, after one night sailing around the point, no signal appeared on the ship radar. As the current was not so strong, the absence of the buoy was found to be suspicious, so that the ship went back to Nice to fetch 3 divers, in order to explore the BOUSSOLE site below the sea surface (the weather forecast for the 3rd day was very good).

So, on the 3rd day, 1 diver was towed with the inflatable dinghy about 15 meters below the sea surface, all around the BOUSSOLE nominal point. Nothing was seen, so that the Tethys-2 could approach the point and explore under the sea surface with the sounder with no risk to strike the head of the buoy. Finally, one signal was received from a depth of 20 meters, and when the divers went at sea

at this point, they found only the lower part of the buoy, with only 1 screw remaining from the upper part.

Finally, as the buoy lower part was found to be in a very good state by the divers, the new upper part was installed on the last day of the BOUSSOLE 61 cruise by divers from IX SURVEY divers (divers from former SAMAR company, working now for IX SURVEY), while scientific staff from Tethys-2 performed an "usual" BOUSSOLE day of measurements (CTD casts including transect, SPMR, Secchi disk, etc).

2.3 Upper Section reinstallation (2007-02-23)

Once again, this operation was scheduled with the help of a helicopter to bring the upper part on BOUSSOLE site. No problem occurred during this operation.

3. QUANTITATIVE SUMMARY

The deployment lasted 248 days, among which 48 days were without data acquisition, due to a broken junction box electric pin (37 days). The 11 days of data acquisition between the BOUSSOLE cruise #54 and the lost of the upper part of the buoy were also lost.

4. INSTRUMENT SCHEDULE

?????

5. ANY PROBLEMS ENCOUNTERED ?

1- biofouling: mooring resté encore trop longtemps a l'eau

2- serrage trop important des colliers métalliques autour des boitiers etanches en delrin (CLC)

6. LESSONS LEARNED

1- biofouling: mooring resté encore trop longtemps a l'eau

2- ne pas trop serrer les colliers métalliques autour des boitiers etanches en delrin (CLC)

idem section 5 !!!

7. ACKNOWLEDGEMENTS

The BOUSSOLE project has been set up thanks to the work of numerous people, and thanks to the support and funding of several Agencies and Institutions. The latter are listed in the foreword of this report. Specifically, the following contracts are acknowledged : the French Space Agency CNES provided funds through the TAOB and TOSCA scientific committees, ESA through ESTEC contract N°14393/00/NL/DC, including CCNs #1, #2 and #3, ESRIN through contract N° 17286/03/I-OL, and NASA through a "Letter of Agreement". Funding has been also obtained from the French CSOA committee and the "Observatoire Océanologique de Villefranche".

The crews and Captains of the following ships are also warmly thanked for their help at sea : the Castor-02 vessel from the Fosevel Marine company (buoy/mooring operations), the INSU R/V Téthys-II and Georges Petit (regular monthly cruises), the GG-IX from the Samar company and the Nika-III (on-demand short operations on site). Pilots and crew members of the Valair and Commerçair helicopter companies are also thanked for their willingness in accomplishing for us unusual survey missions above the BOUSSOLE site. Emmanuel Bosc, Maria Vlachou, Guillaume Lecomte, who have

occasionally provided some help in collecting data, are also thanked for their help.

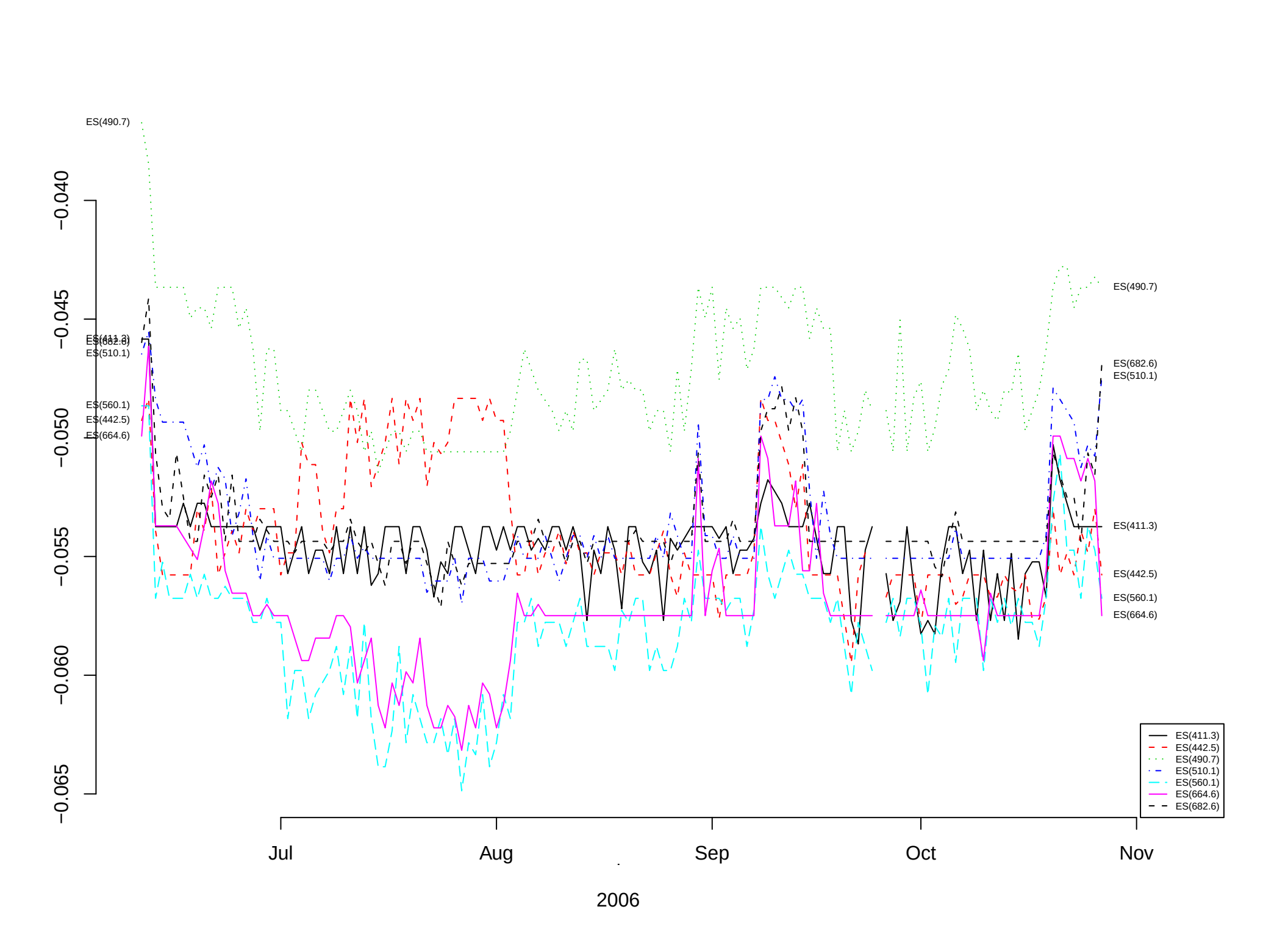
The French institute IFREMER and the Norvegian Marintek company are also thanked for their help and fairness in the engineering studies that were ordered to them after the major failure of the buoy in spring of 2002.

The data that are collected for several years near the BOUSSOLE site by the French weather forecast Agency, "Meteo France", and which are provided in real time on the internet, have been of great help in the day-to-day management of the monthly cruises.

Two companies have largely contributed to the BOUSSOLE project, namely the ACRI-in/Genimar company, Sophia Antipolis, France (buoy conception) and Satlantic Inc., Halifax, NS Canada (buoy centralized acquisition system and radiometers); their help is specifically acknowledged here.

8. DAILY DATA COLLECTION SHEETS

The following pages are meant to summarize the data collected each day by the buoy.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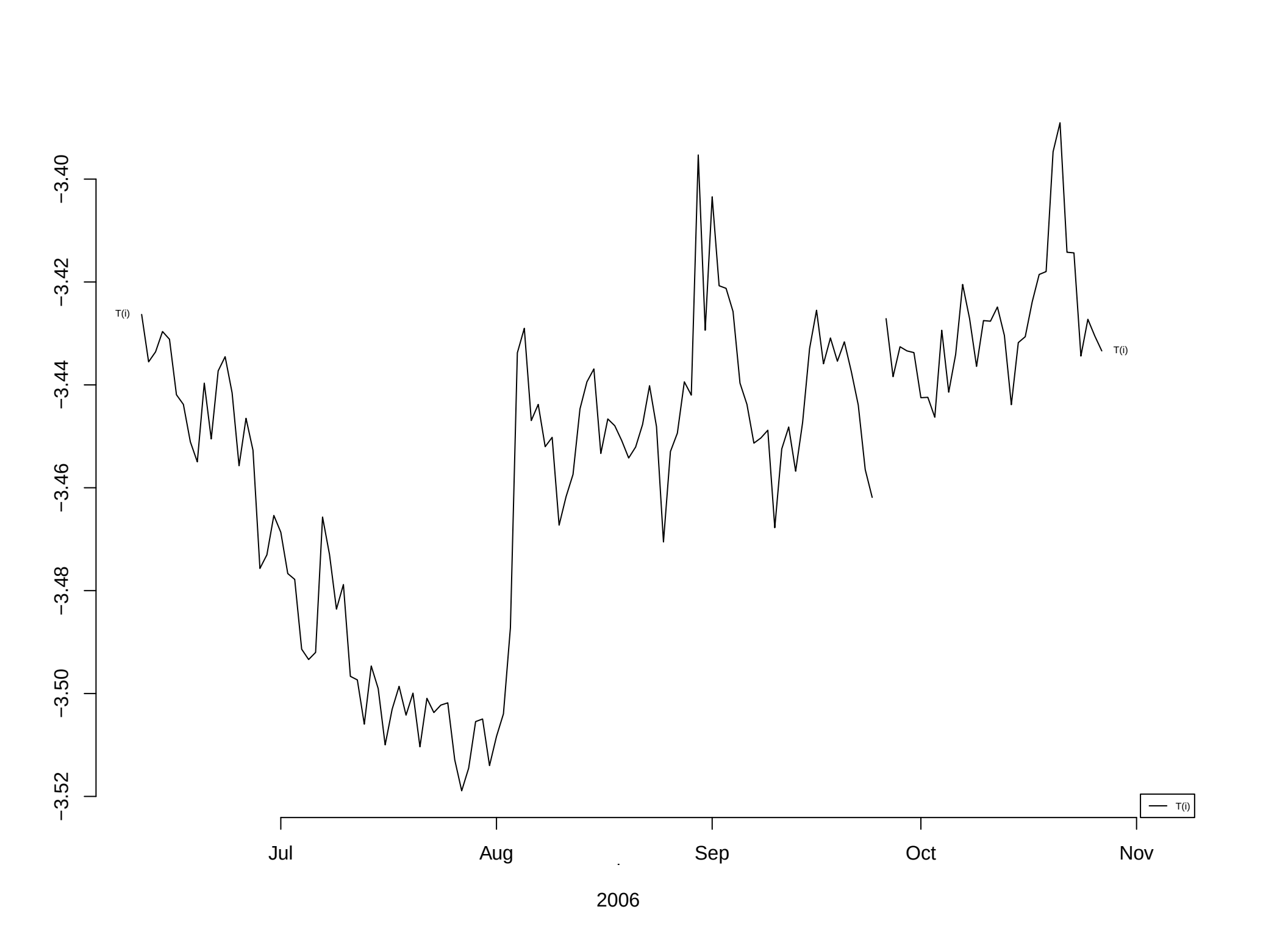
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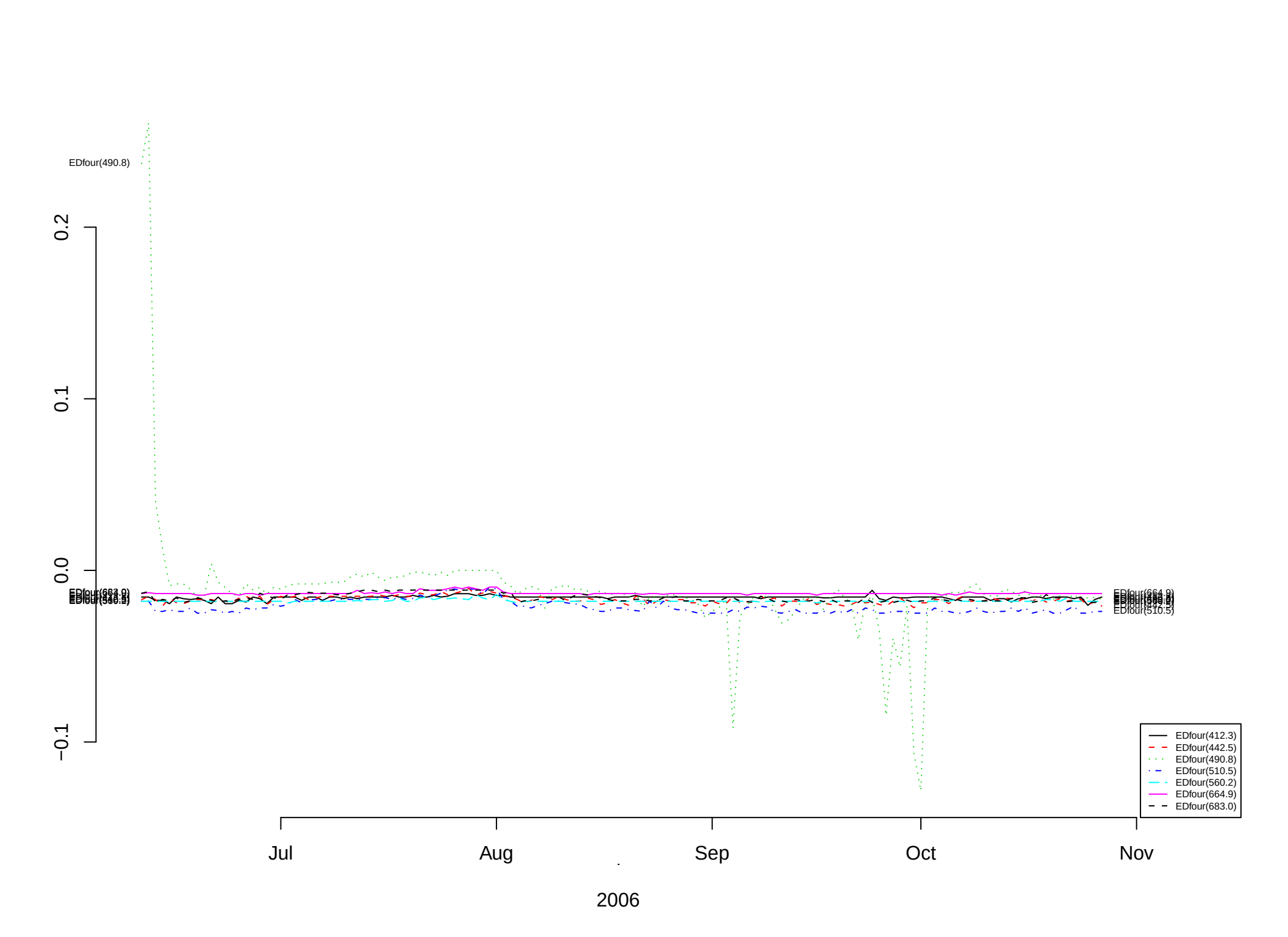
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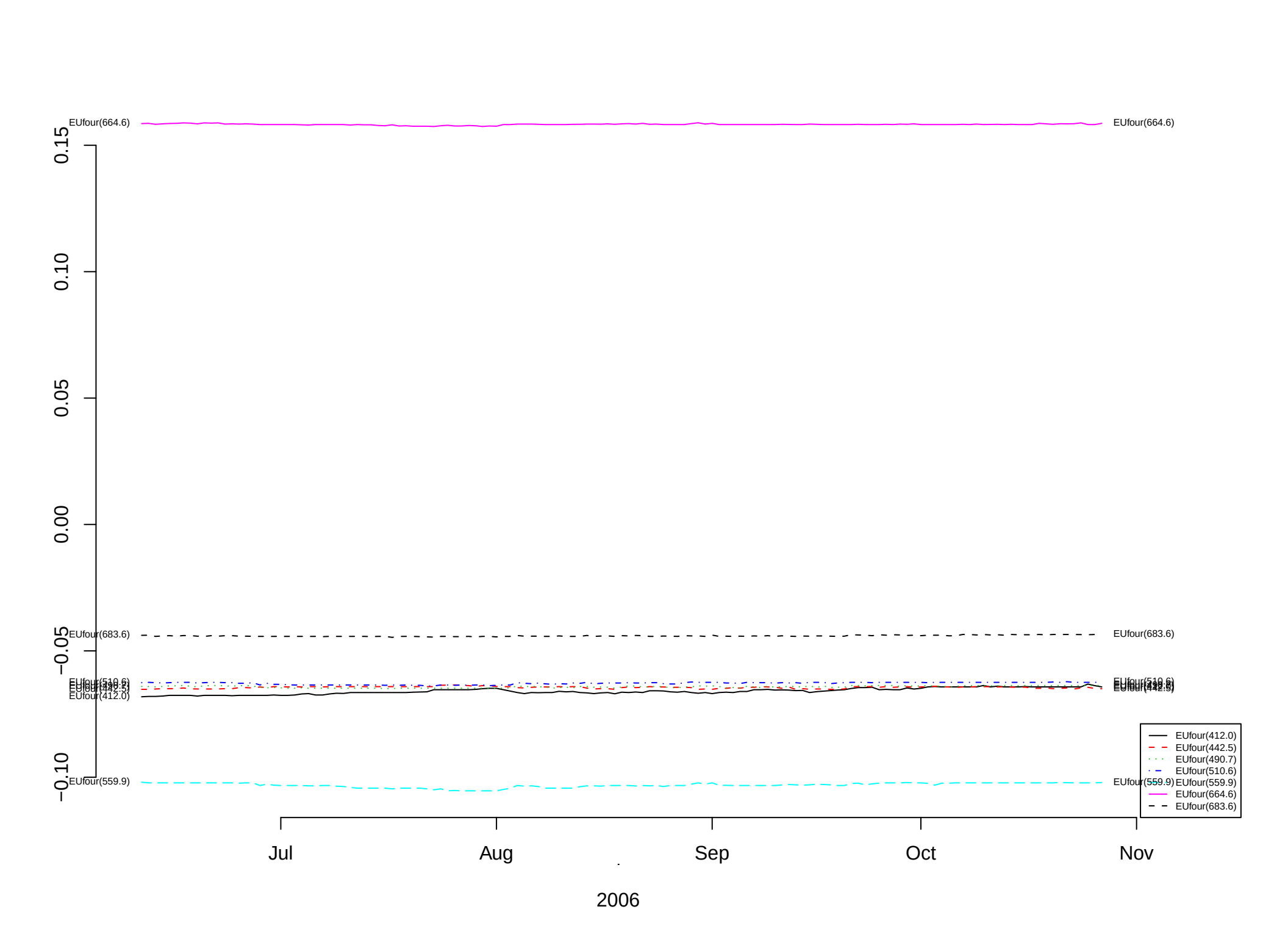
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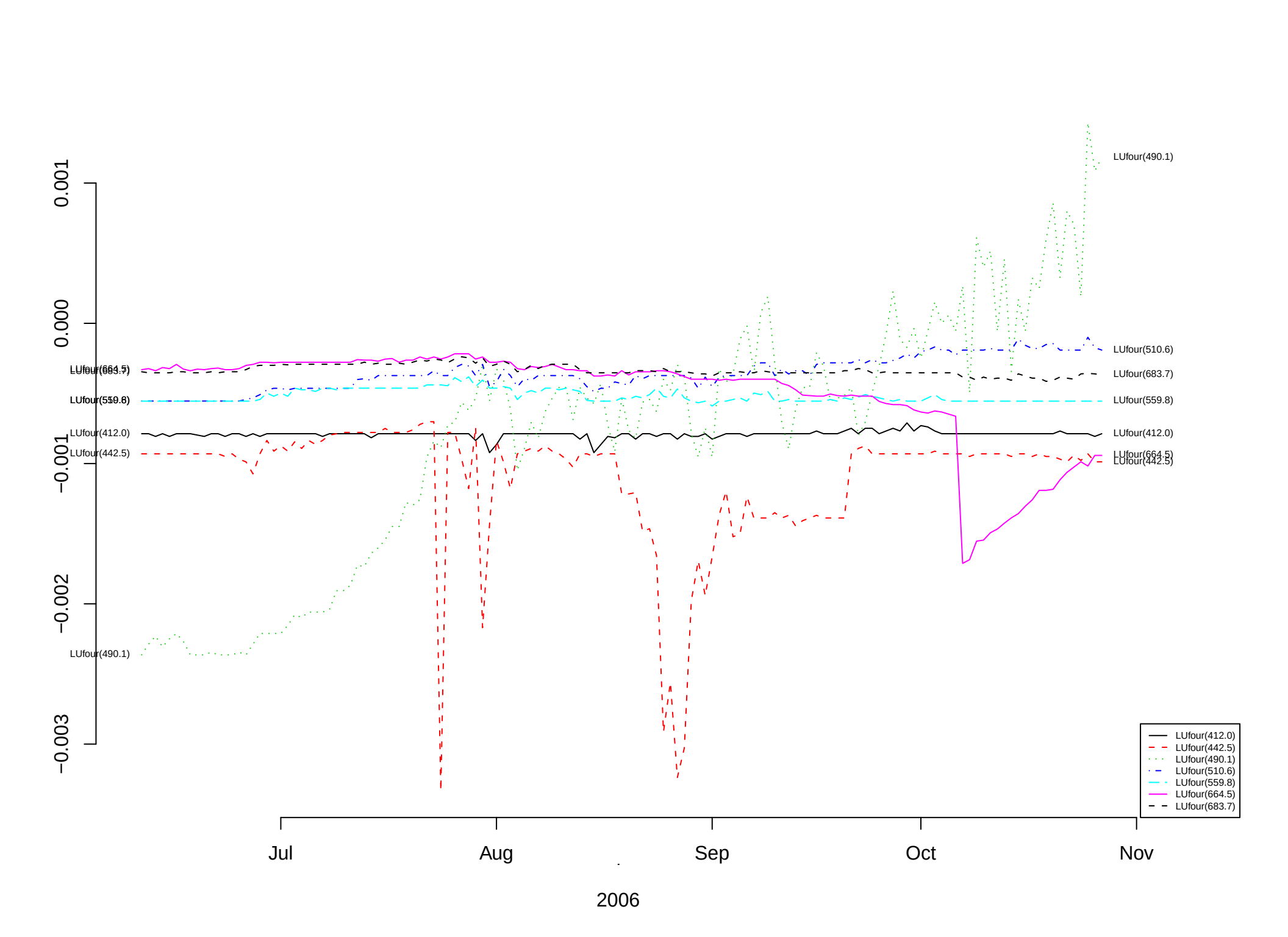
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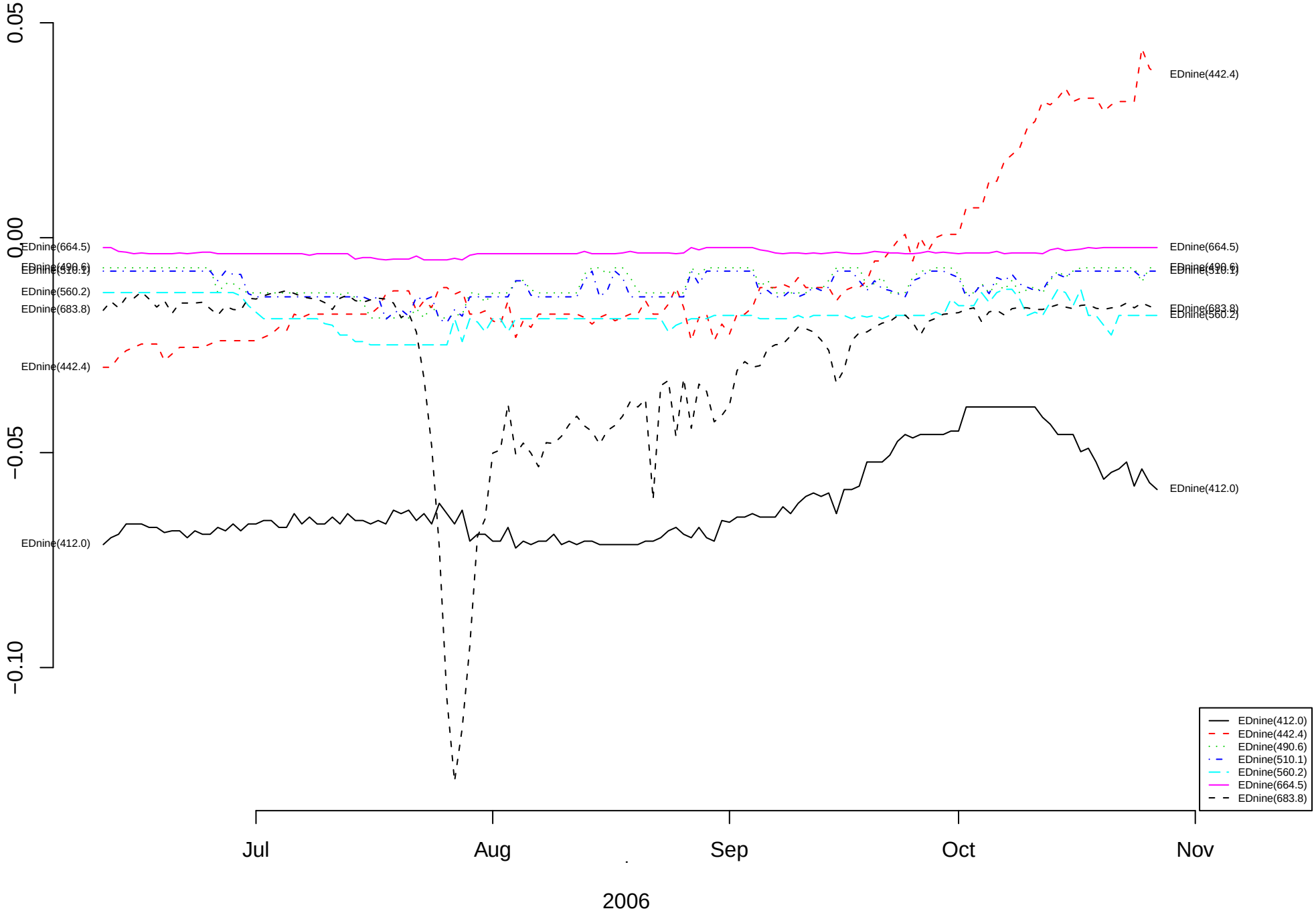
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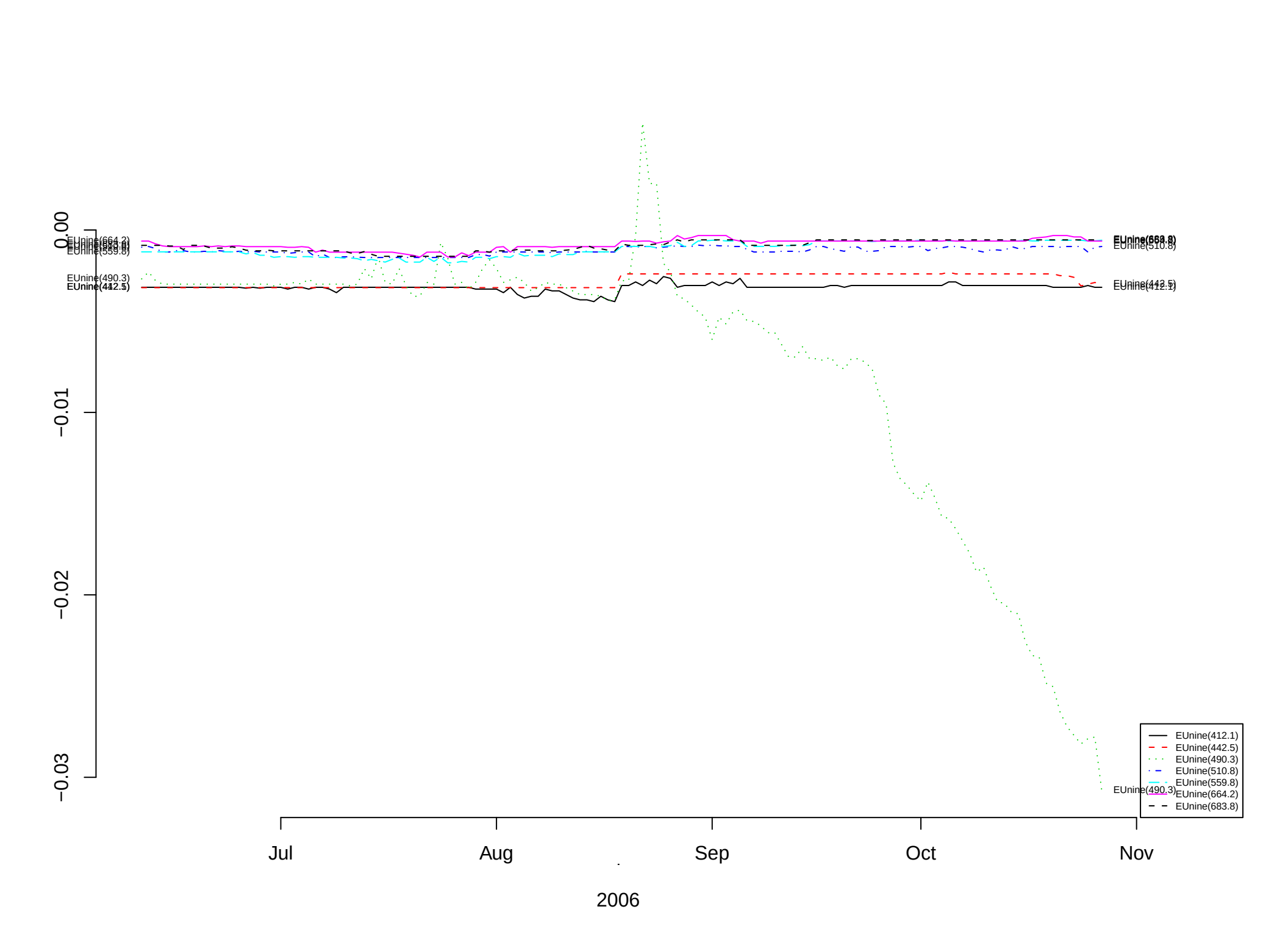
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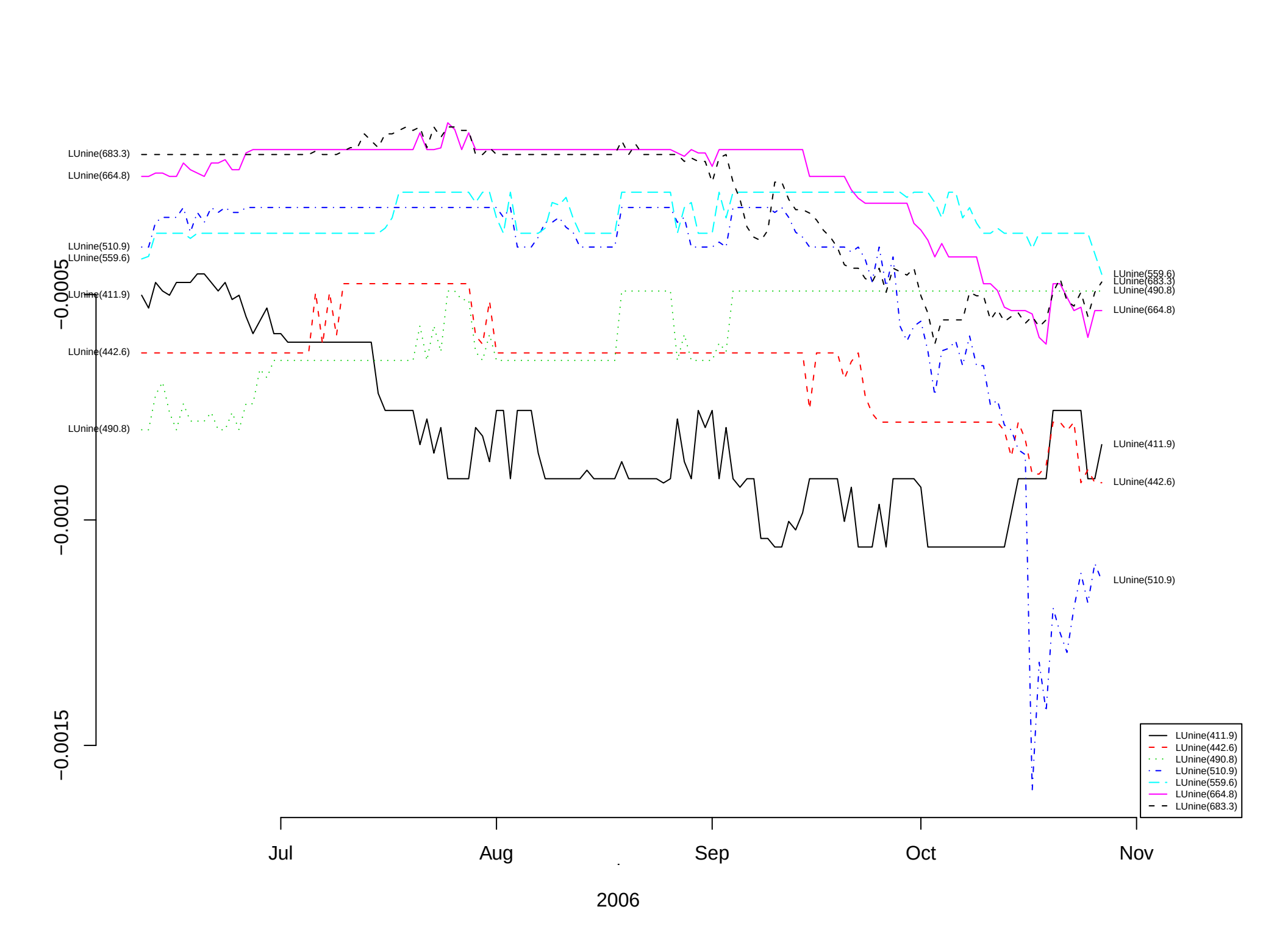
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