

A SOFTWARE FOR TIME SERIES ANALYSIS OF NORTEK INSTRUMENTS: TSA_NORTEK_V1

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Abstract. The software TSA_NORTEK_V1 has been created to carry out the processing of data obtained by NORTEK currentmeters: AWAC, AQUAPRO and AQUADOPP. The software offers a default data processing (spectral analysis, harmonic analysis, calculation of residual series) and an optional processing (axes rotation, choice of depth for the analysis, processing of vertical velocity component and filtering of time series). In addition, TSA_NORTEK_V1 produces harmonic constituents files to be used with the tidal prediction software TIDEX.

Keywords software, processing data, time series analysis, AWAC, AQUAPRO, AQUADOPP.

I. INTRODUCTION

TSA_NORTEK_V1 software has been created by the Physical Oceanography Group of University of Cádiz in collaboration with the Instituto Hidrográfico de la Marina and INNOVA oceanografía litoral SL to carry out the processing of current meter data from NORTEK instruments: AWAC, AQUAPRO and AQUADOPP. TSA_NORTEK_V1 is written in Matlab language but it has been compiled to works independently of that.

The program begins asking for some information (Fig. 1). First, you should indicate which instrument has captured the data set. There are three options: AQUADOPP (current meter), AQUAPRO o AWAC (current profilers). Then, you should indicate the mooring position and the header file name, to open and extract the more relevant information about the mooring and instrument configuration. Until this point, the data entering is common to any analysis you want to do. From here, certain, minor, differences come depending on the instrument used since AQUADOPP data slightly varies from AQUAPRO and AWAC ones.

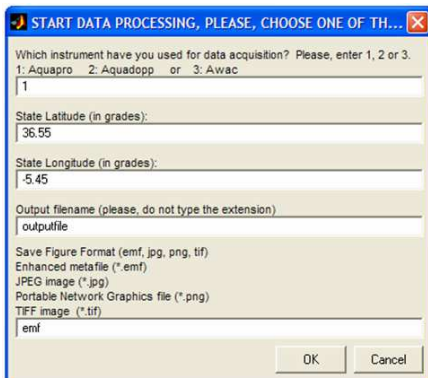


Fig. 1. Start data processing window.

II. RUNNING TSA_NORTEK_V1 TO AQUAPRO AND AWAC DATA

Processing of AQUAPRO and AWAC data has the same features (both are current profilers) and, therefore, the software runs equally in both cases. Once the header file is opened, the program shows the most relevant information related to the mooring and instrument configurations (Fig. 2): mooring position, sample duration, sample interval, cell size, blanking distance, mean mooring depth and cells depth.

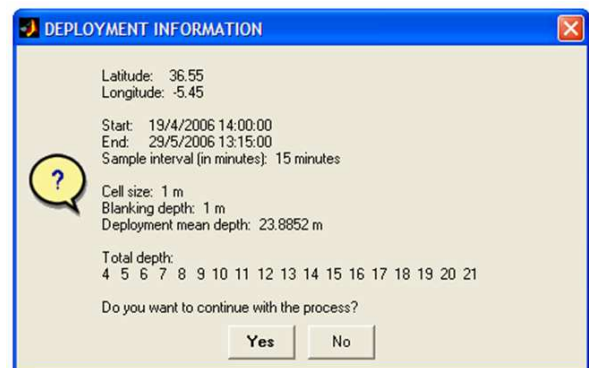


Fig. 2. Deployment information window.

AQUAPRO and AWAC data are available along the whole water column at different depths and so you can choose the desired depths for data analysis. As an aid, the program displays two graphics (Fig. 3). First, displays the pressure (sea level) and velocity time series of the five most shallow layers.

The second one shows the time averaged current velocity profile for the chosen period. Once the depths for the analysis are selected, the software carries out an optional and a default data processing (Fig. 4).

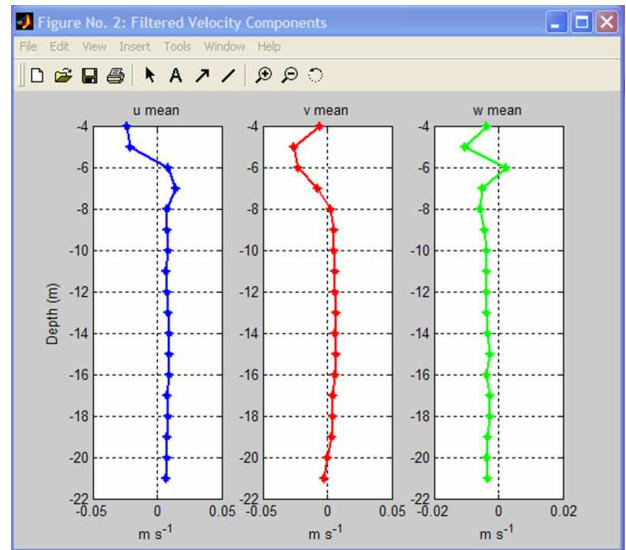
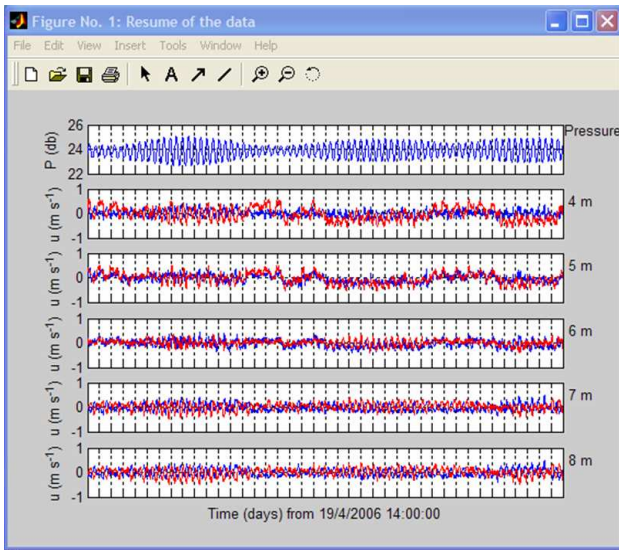


Fig. 3. Graphics of TSA_NORTEK_V1 to facilitate the choice of the desired depths for the data analysis.

Optional data processing:

- Axes rotation to project the velocity data on the predominant direction.
- If several depths were chosen, you can decide between the data analysis for each depth or for the averaged depths.
- In many cases the value of the vertical velocity is not necessary for the study and then the analysis of this velocity component is optional.
- If desired, it is possible to obtain a filtered series of velocity and sea level data.

Default data processing:

- Spectral analysis of original and/or residual series (Fig. 5).
- Harmonic analysis of time series using T_TIDE.M (Pawlowicz *et al.*, 2002).
- Velocity and sea level tidal prediction for the mooring dates and computation of residual series.
- Creation of harmonic constituent files for tidal prediction software TIDEX.

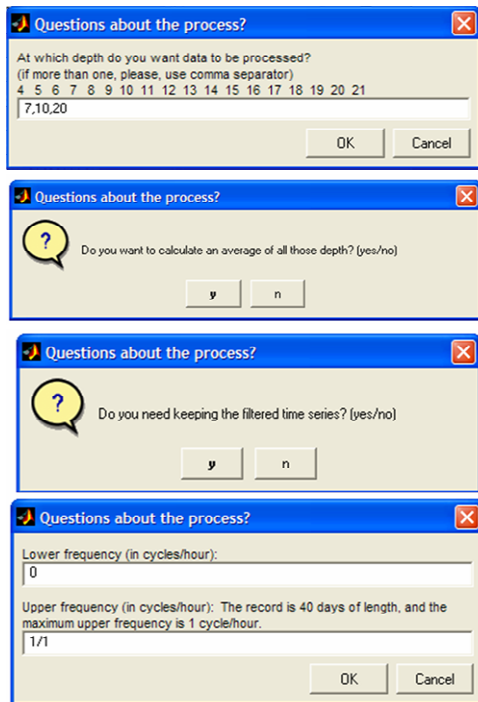


Fig. 4. Choice of depths window and some questions about data processing.

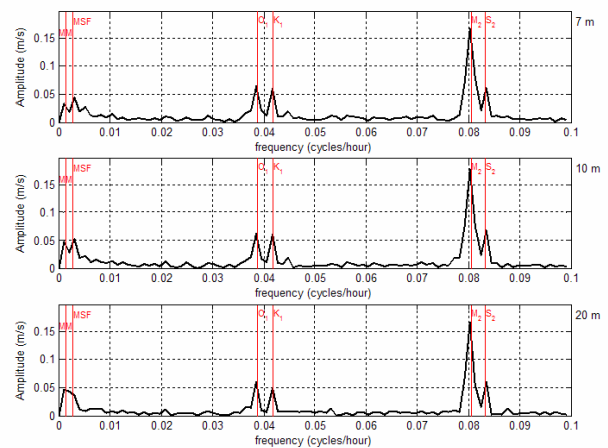


Fig. 5. Spectral analysis graphic.

The results from data analysis are saved in a set of files:

- A data processing information file.
- Harmonic analysis results for each depth (or averaged depths), each velocity component and sea level.
- Harmonic analysis results for each depth (or averaged depths), each velocity component and sea level compatible with TIDEX software.
- Residual series for each velocity component and sea level.

- Filtered data for each velocity component and sea level (only if filtered data option is chosen).
- Spectral analysis graphics for original and/or residual velocity and sea level data.

III. RUNNING TSA_NORTEK_V1 TO AQUADOPP DATA.

The data recorded by an AQUADOPP refer only to one depth, where instrument is placed. Therefore, the software varies slightly. The principal differences are three:

- Mooring information and depth choice. As there are not time series in different depths, it is not necessary to choose the desired depth to analyse.
- Sea level series analysis. Due to the fact that the instrument is moored at a certain depth suffering the displacement of the mooring line these measurements are frequently noisy and its analysis is not worthwhile.
- Output files. The number of result files is lesser by the cited reasons: Sea level analysis is not carried out and only one depth is processed.

REFERENCES

Pawlowicz, R., B. Beardsley and S. Lentz (2002), Classical tidal harmonic analysis including error estimates in MATLAB using T_TIDE. *Computers Geosciences*, 28, 929-937.