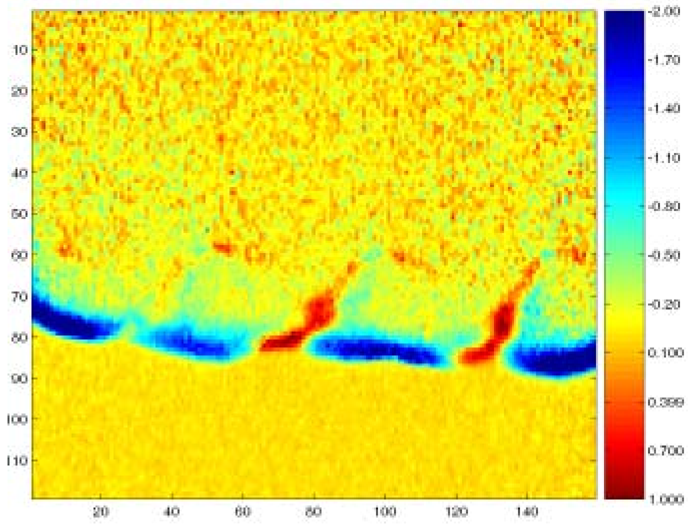
O2dynamics-2d - development status

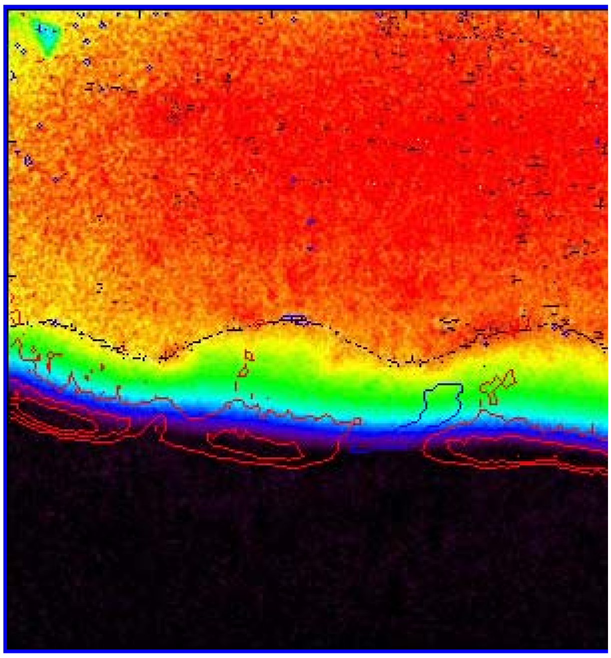
This page describes the updates, bug-fixes and additional features added to the O2dyn package. The development prior to version 1.1.2 has not been recorded.

Version 1.1.2 (08/04/2003)

1. The **imageleg.m** function was updated in such a way that it can handle RGB images, i.e. images of size M x N x 3. If the images are "normal", i.e., M x N matrices, the function behaves as before. For the RGB images, the legend bar is not drawn yet, but it is planned to be done so.
2. I created a script **blendcntr.m** which enables blending specified images with the contour plot of another image. In particular, images of oxygen distribution, plotted in false colours, are superimposed with the contour plot of the respiration rate calculated by O2dyn. These images can then be converted into video, as done in the example below.

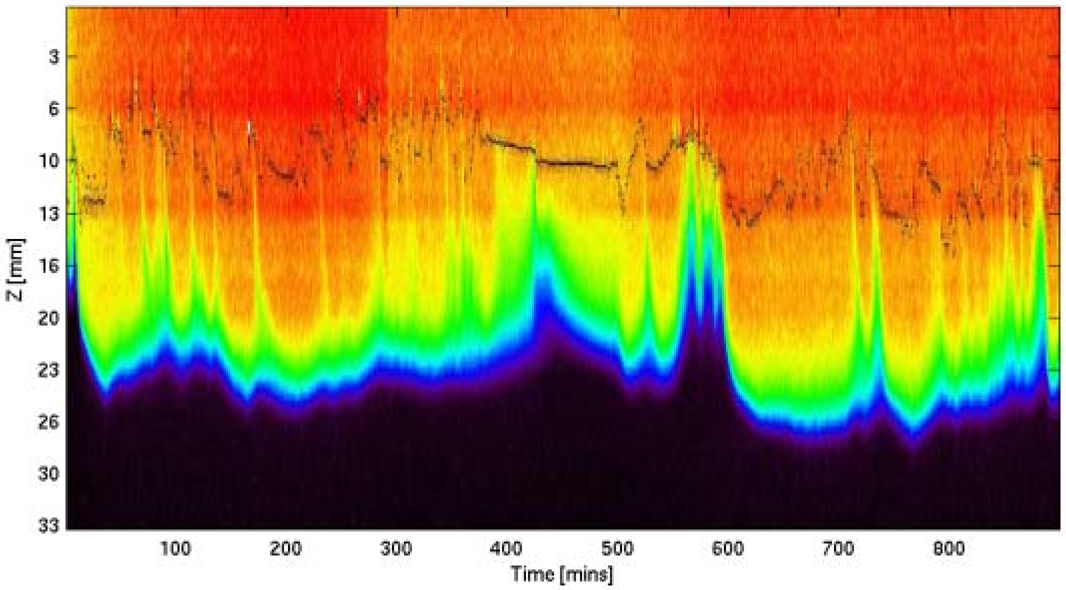


Respiration rate profile



Click on the image to play the v

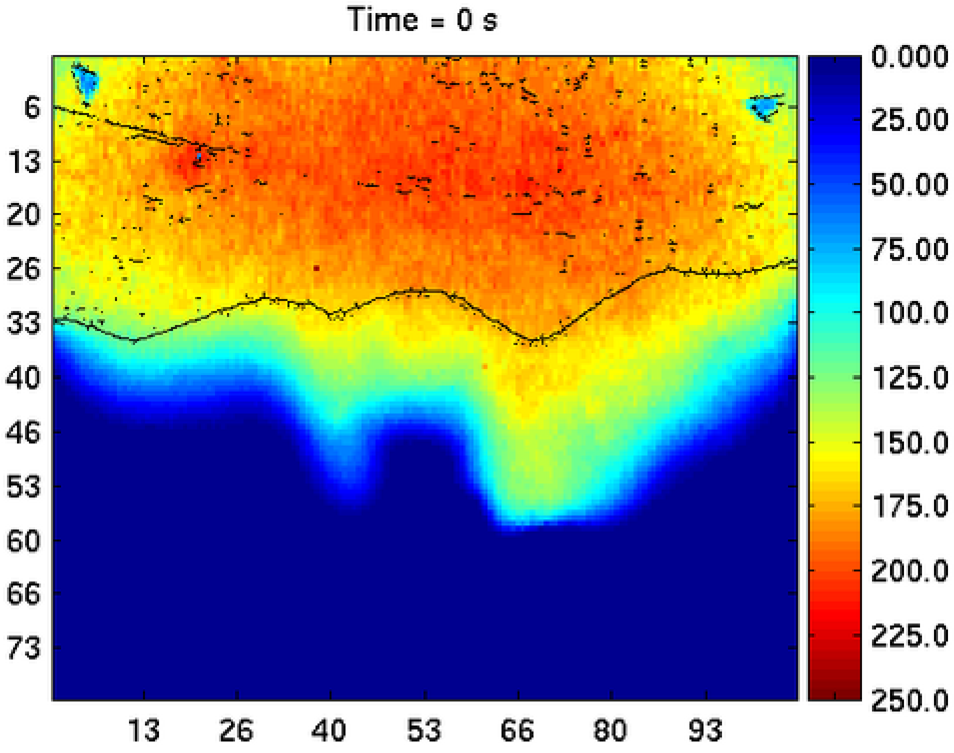
3. I wrote a script **jpg2ot.m** which enables extraction of a particular vertical profile of O2 from the jpg images supplied by MolliView and plots them one after another in order to see the time evolution of the O2 profile. In the example below, 900 vertical O2 profiles contained in 900 images were extracted.



Vertical O2 profiles as a function of time.

Version 1.1.3 (09/04/2003)

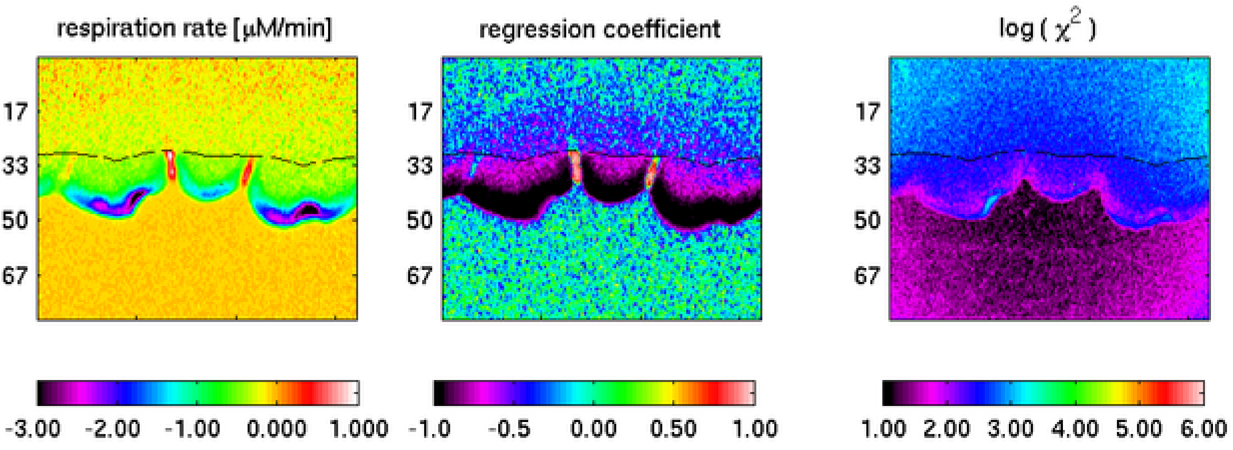
1. I enhanced the script **b16topng.m** with further functionality. Firstly, the io2 matrix need not be filled (by running O2dyn or loading the *.mat file) prior to running the script. Instead, the *.b16 images are loaded and the corresponding PNG images are printed. The user can specify whether a surface line should be included in the image, and if so, he/she must specify from which file this surface line is to be calculated (using edge detection algorithm). The user can further specify whether the legend bar and the X/Y tick labels should be printed or not. The results then look something like this:



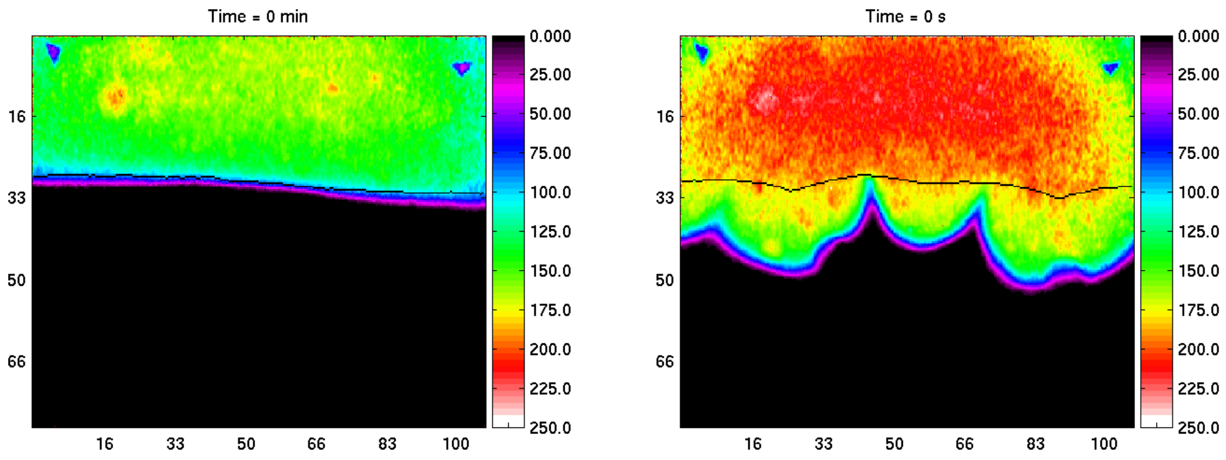
2. In order to facilitate the changes in the b16topng.m script, the function **imageleg.m** has also been modified as well as new functions, namely **getid.m** and **plotsl.m** in the auxil directory, have been created.

Version 2.0 (15/04/2003)

1. In version 2.0, many things have been changed to facilitate a more convenient handling of the images. The most important change is that the images are not stored as uint16 numbers in a stream of *unknown* length (B16 files) but instead as *matrices* of int16 numbers in the Matlab format (MAT files) that can be loaded using LOAD command. This way, the dimensions of the images are contained in the image files. This change induced a number of changes in subsequent handling of the images.
2. Another important change concerns the handling of the input parameters for the scripts used to manipulate the data. The most important image processing scripts are in the CORE directory. The parameters necessary for running those scripts are in the PARAM directory and can be specified by editing the corresponding PAR_ file, e.g., PAR_O2DYN.M to specify parameters for O2DYN.M script, etc.
3. The default colormap was changed to so called LUT colormap, so as to make it compatible with images obtained by other applications (such as MolliView). The images in this new colormap look like this:



4. The conversion of MAT images storing the O2 concentration profiles into PNG has been rewritten. Now, scripts **mat2png_1** and **mat2png_n** should be used for this purpose. It is possible to include a surface line in the PNG images, where **_1** means that the surface line from *one* background image is calculated and superimposed with the O2 images (good for, e.g., displaying the surface line in the 2D profile of the respiration rate and the corresponding evolution of O2 concentration), and **_n** means that the surface line is calculated *separately* for each O2 image from a separate background file (good for displaying the O2 dynamics in, e.g., a sandy sediment with moving ripples, where the surface line changes over time). The videos of the O2 dynamics then look like shown below:



O2 dynamics obtained by **mat2png_1.m** script. O2 dynamics obtained by **mat2png_n.m** script.

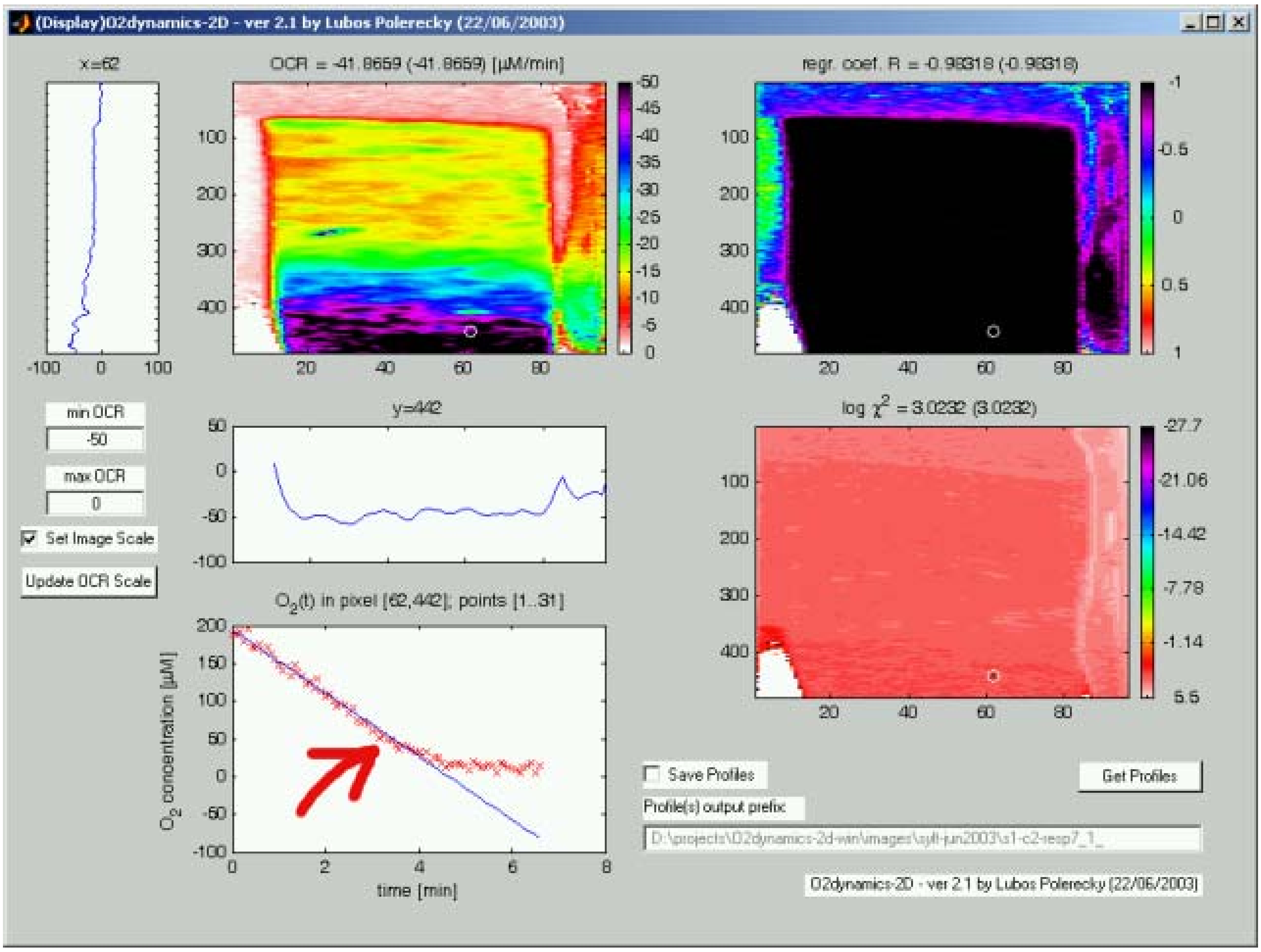
5. The possibility of including surface line has been expanded to the following scripts: O2dyn, mat2png_1, mat2png_n, browseO2dyn.

Version 2.1 (27/06/2003)

1. In many experiments, oxygen concentration in many pixels leveled off at values close to zero while it was still decreasing in other points. This feature was not be dealt with correctly in the version prior to 2.1. The only solution to avoid this type of O2(t) pixel-series was to include less images in the evaluation of the OCR image. This had, however, one not very pleasant drawback, namely the decrease of O2 in many pixels was not sufficient so as to exceed the noise level ofthe O2 images, which resulted in a not very confident values of OCR at those pixels.

   The analysis of O2(t) containing this type of features has been improved in version 2.1, where the linear fit of the O2(t) has been modified in such a way that **only time-points where the O2 concentration does *not* go below a specified threshold value** (e.g., 0, 20 uM, etc.) **are used for fitting.** The remaining points, which are exactly those points where the O2(t) has leveled off, are excluded from the fit.

   The above description can be probably clearer understood from the figure below, depicting the slightly modified GUI of the O2dyn script. The newly developed feature can be seen in the lower-left graph.



(Display)O2dynamics-2D - ver 2.1 by Lubos Polerecky (22/06/2003)

min OCR

-50

max OCR

0

☑ Set Image Scale

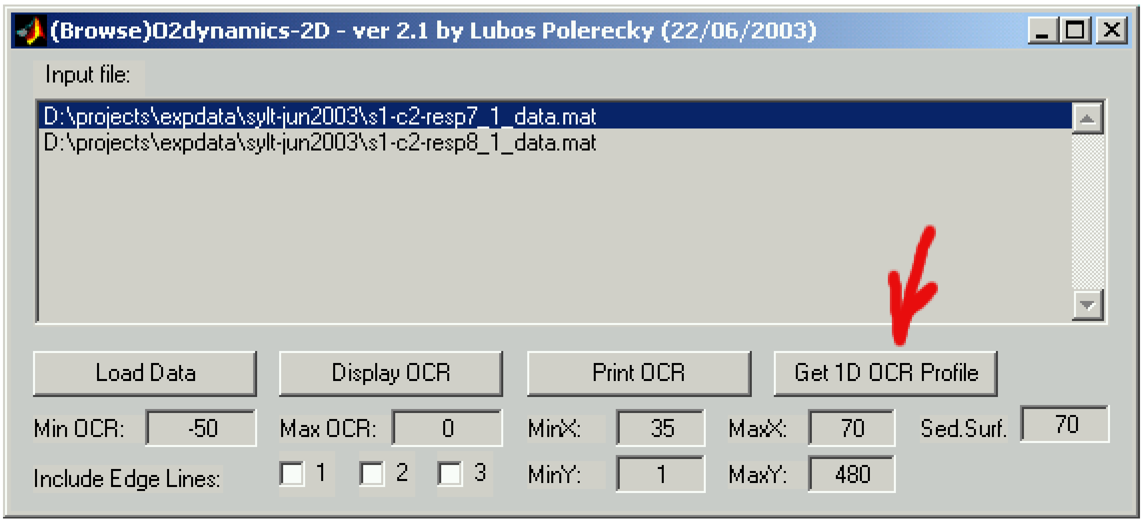
☐ Save Profiles

Profile(s) output prefix

D:\projects\O2dynamics-2d-win\images\sylt-jun2003\s1-c2-resp7_1_

O2dynamics-2D - ver 2.1 by Lubos Polerecky (22/06/2003)

2. The **browseO2dyn** script has been enhanced by adding a new feature, namely the possibility of calculating a **vertical profile of the OCR averaged horizontally over a specified pixels** (from minX to maxX), as shown in the screenshot below.



(Browse)O2dynamics-2D - ver 2.1 by Lubos Polerecky (22/06/2003)

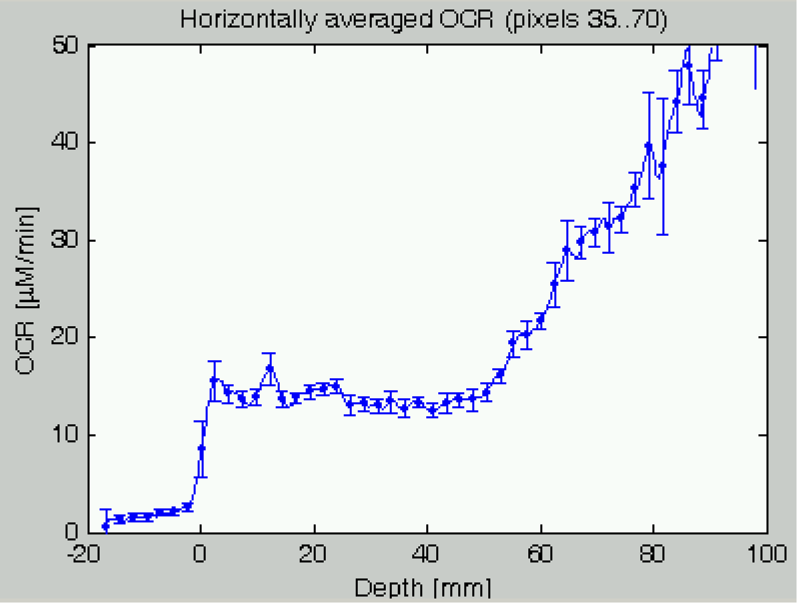
Input file:

D:\projects\expdata\sylt-jun2003\s1-c2-resp7_1_data.mat
D:\projects\expdata\sylt-jun2003\s1-c2-resp8_1_data.mat

Min OCR: -50 Max OCR: 0 MinX: 35 MaxX: 70 Sed.Surf. 70

Include Edge Lines: □ 1 □ 2 □ 3 MinY: 1 MaxY: 480

By clicking on the "Get 1D OCR Profile" button, the vertical profile is calculated, displayed (see below) and the data and graphs are saved on the disk.



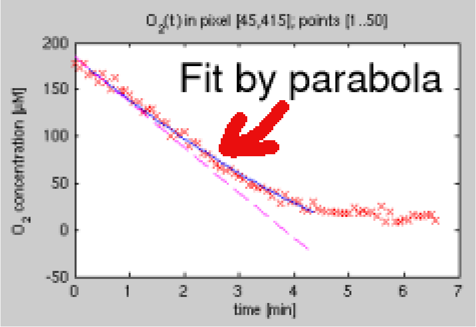
3. The occurances of wiener2(...) and edge(...,'canny',...) throughout the code have been **substituted by getsmooth(...) and get_edge(...)**, respectively, to make it easier to change the filthers or edge-detection algorithm throughout the whole set of scripts, should one require to do so. These functions are coded in the **getsmooth.m** and **get_edge.m** files, respectively.

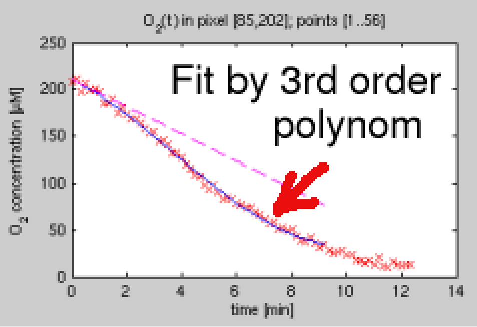
Version 2.1.5 (23/08/2003)

Progress report since v2.1 was not kept properly. Sorry. In summary, the development consisted mainly of bug-fixing.

1. In version 2.1.5, **fitting of O2(t) by a polynom of up to the 4th order** can be chosen. The order of the polynom is specified in the par_O2dyn.m as a variable **polorder**. As a result, the data of O2(t), for which of course O2(t)>O2_threshold(**), will be fitted by a polynom in each pixel of the O2 image, and the corresponding OCR is taken as the coefficient in front of the linear part of O2(t), e.g., for a fit by a polynom of the 2nd order, O2(t) = a2*t^2 + a1*t + a0, where **OCR=a1**. This corresponds to the rate of the oxygen consumption in the limit t->0+.

   A screenshot of how this fit looks like (part of the O2dyn GUI window) is shown here:





(**) Note: this is valid only for the fits by line and parabola. The fits by the polynom of the 3rd or 4th order fit **all** the data quite nicely without any additional conditions.

Version 2.1.6 (29/08/2003)

New options were added in the **browseO2dyn** window. In particular:

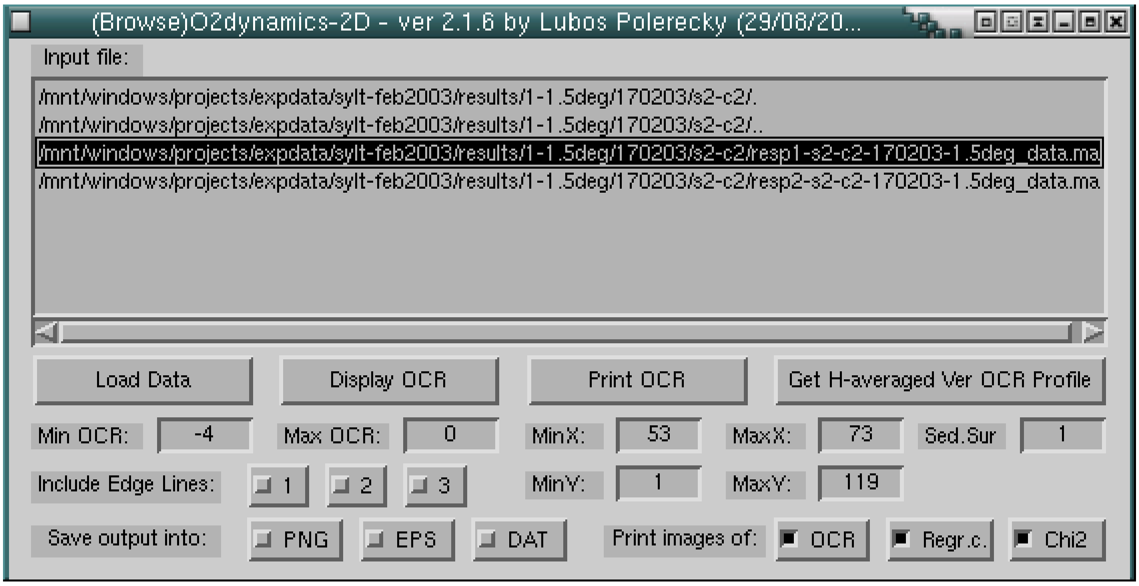
1. The browsing of the MAT files is **not limitted** to only a single directory specified in par_browseO2dyn.m but one can also **browse through the directory structure** to find other locations of the MAT files.

2. One can specify **whether or not the images and/or graphs should be printed into PNG/EPS files** when "Print OCR" or "Get H-averaged 1D OCR profile" is clicked. Similarly, one can specify **whether or not the 1D profiles should be saved into the output DAT file** when clicking on "Get H-averaged 1D OCR profile".

   This is usefull if one wishes to view the OCR images/graphs under different settings, such as a different area of the images, without overwriting the previously stored images/graphs/data files.

3. One can also specify **which of the images of OCR, chi2 and regression coefficient should be printed** (into the output PNG/EPS files) by checking the appropriate checkboxes.

A screenshot of this new GUI of the browseO2dyn is shown below.


(Browse)O2dynamics-2D - ver 2.1.6 by Lubos Polerecky (29/08/20...

Input file:

```
/mnt/windows/projects/expdata/sylt-feb2003/results/1-1.5deg/170203/s2-c2/.
/mnt/windows/projects/expdata/sylt-feb2003/results/1-1.5deg/170203/s2-c2/..
/mnt/windows/projects/expdata/sylt-feb2003/results/1-1.5deg/170203/s2-c2/resp1-s2-c2-170203-1.5deg_data.ma
/mnt/windows/projects/expdata/sylt-feb2003/results/1-1.5deg/170203/s2-c2/resp2-s2-c2-170203-1.5deg_data.ma
```

Min OCR: -4 Max OCR: 0 MinX: 53 MaxX: 73 Sed.Sur 1

MinY: 1 MaxY: 119

Include Edge Lines: □ 1 □ 2 □ 3

Save output into: □ PNG □ EPS □ DAT

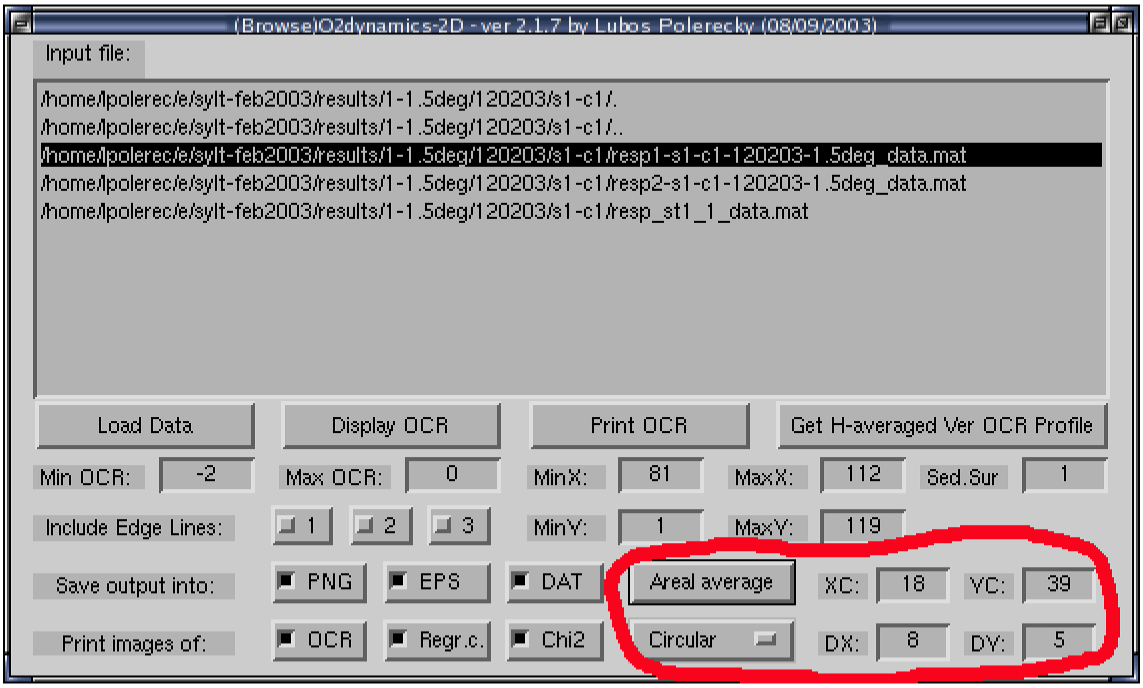
Print images of: ■ OCR ■ Regr.c. ■ Chi2

Version 2.1.7 (08/09/2003)

1. When browsing the MAT files by browseO2dyn, sometimes it happened that an empty line (or

more) appeared in the list of directories and the same number of directories were missing in the list. This was fixed in version 2.1.7.

2. More functionality was added to **browseO2dyn**. In particular, one is able to evaluate the mean value and standard deviation of the OCR over a certain rectangular or circular area (use the **Areal average** button).



(Browse)O2dynamics-2D - ver 2.1.7 by Lubos Polerecky (08/09/2003)

Input file:

```
/home/lpolerec/e/sylt-feb2003/results/1-1.5deg/120203/s1-c1/.
/home/lpolerec/e/sylt-feb2003/results/1-1.5deg/120203/s1-c1/..
/home/lpolerec/e/sylt-feb2003/results/1-1.5deg/120203/s1-c1/resp1-s1-c1-120203-1.5deg_data.mat
/home/lpolerec/e/sylt-feb2003/results/1-1.5deg/120203/s1-c1/resp2-s1-c1-120203-1.5deg_data.mat
/home/lpolerec/e/sylt-feb2003/results/1-1.5deg/120203/s1-c1/resp_st1_1_data.mat
```

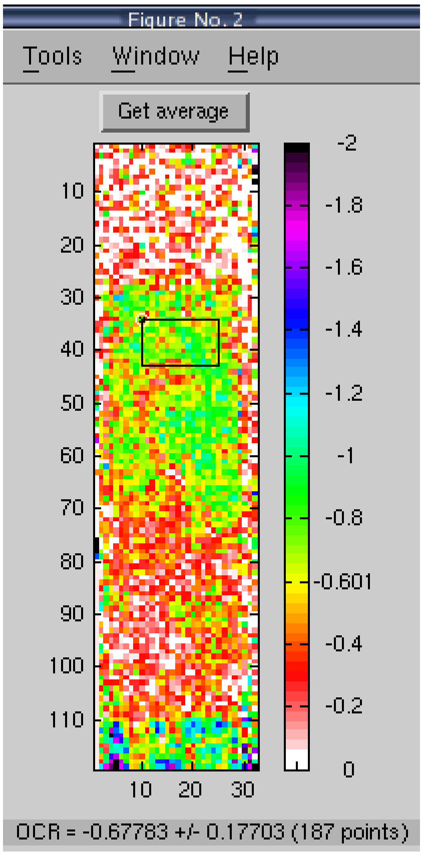
Min OCR: -2 Max OCR: 0 MinX: 81 MaxX: 112 Sed.Sur 1

Include Edge Lines: □ 1 □ 2 □ 3 MinY: 1 MaxY: 119

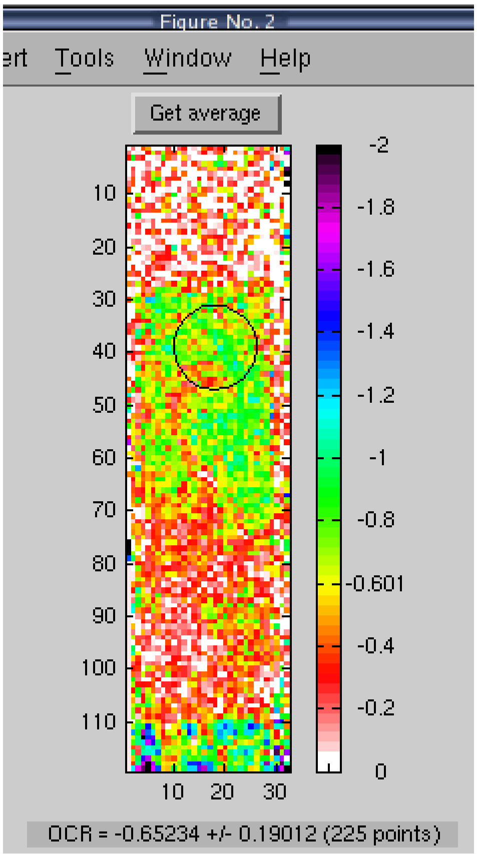
Save output into: ■ PNG ■ EPS ■ DAT XC: 18 YC: 39

Print images of: ■ OCR ■ Regr.c. ■ Chi2 Circular DX: 8 DY: 5

When the Areal average button is clicked, a window will pop-up in which one can select either the rectangle or circle of interest (use *left* click to the *select* the point's location (move it around) and *right* click to *set* the location of the point to the last selected location). The averaged value of the OCR is displayed inside the pop-up window as well as in the main Matlab window.



OCR = -0.67783 +/- 0.17703 (187 points)



OCR = -0.65234 +/- 0.19012 (225 points)

3. Due to this added functionality, the control objects in the browseO2dyn window has been moved around a bit.

Version 2.1.8 (16/10/2003)

1. A minor bug fix: when one selected the values of MinY and MaxY (in browseO2dyn) as a subset of the original image size (e.g., 20->100 as compared to the original 1->120), the images of the OCR, chi2 and regr.coef generated by "Print OCR" were not cut properly, namely there remained an empty white area at the buttom of the images. This was fixed in version 2.1.8.

Lubos Polerecky (back to main)
Last changes: [2003: 08/04, 09/04, 15/04, 27/06, 23/08, 29/08, 08/09, 16/10]
