TropoExport

OPERATING MANUAL

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Table of Contents

Welcome to TropoExport

Thank you very much for using **«TropoExport»** - Error of Dispersion Calculating Program.

We believe that you'll quickly feel comfortable with **«TropoExport»**.

We even think you will enjoy it soon.

This manual will let you get acquainted with the basic functionality of **«TropoExport»**.

Let's have a look at the user interface to get started...

Use the table of contents on the left to navigate by clicking on it.

Hardware and software requirements

Requirements for hardware

- CPU at least 1 GHz;
- RAM volume mostly defined by the number of records in database. Recommended at least 2 GB;
- free HDD space mostly defined by the size of databases;
- SVGA True Color Graphics Adapter with resolution 1024x786 pixels at least.

Requirements for software

- Microsoft Windows XP and above;
- Microsoft Excel and Access 2000 and above;
- Microsoft Visual C++ 2005 redistribution libraries (must be installed separately);
- escape.dll library (included with **«TropoExport»** installer);
- CIRA.xls file (included with **«TropoExport»** installer);
- Config_ID.xls file (included with **«TropoExport»** installer);
- noise.xls file (included with **«TropoExport»** installer);
- template.xls file (included with **«TropoExport»** installer).

Purpose of the program

The **«TropoExport»** program is intended to calculate average signals according specific algorithms and error of dispersion of measured effective lidar signals with possibility to export results as Access databases or/and Excel spreadsheets for use with other third party applications, like LiRIC, for example.

Common user interface view

Common view of the program is represented at figure 1.

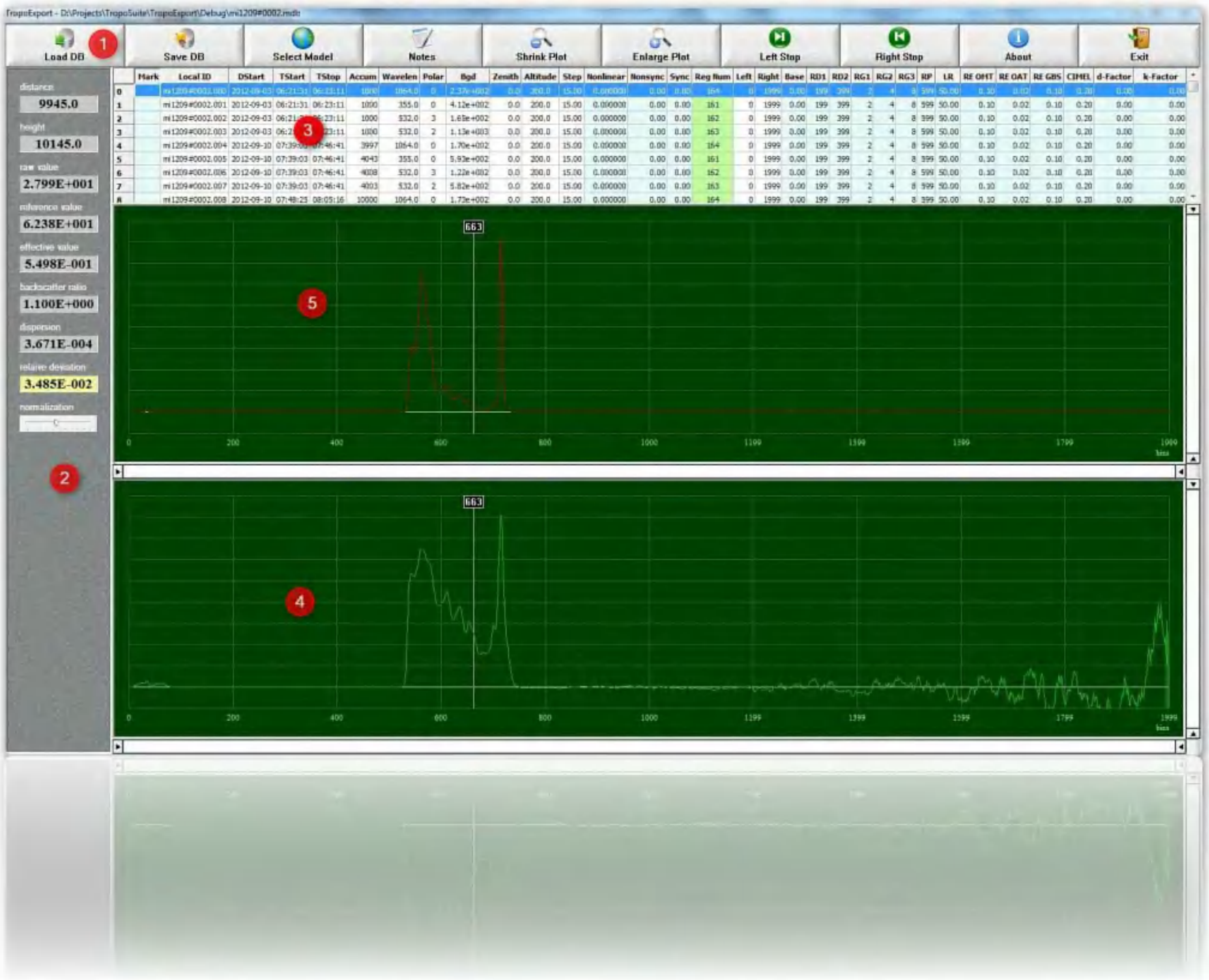

Figure 1

Where:

1. Toolbar area;
2. Calculated values area;
3. Loaded database display grid;
4. Raw lidar backscatter profile(s) area;
5. Calculated error' dispersion profile(s) area.

Loading database

Press «Load DB» button (figure 2) and select desired database (figure 3).

Figure 2

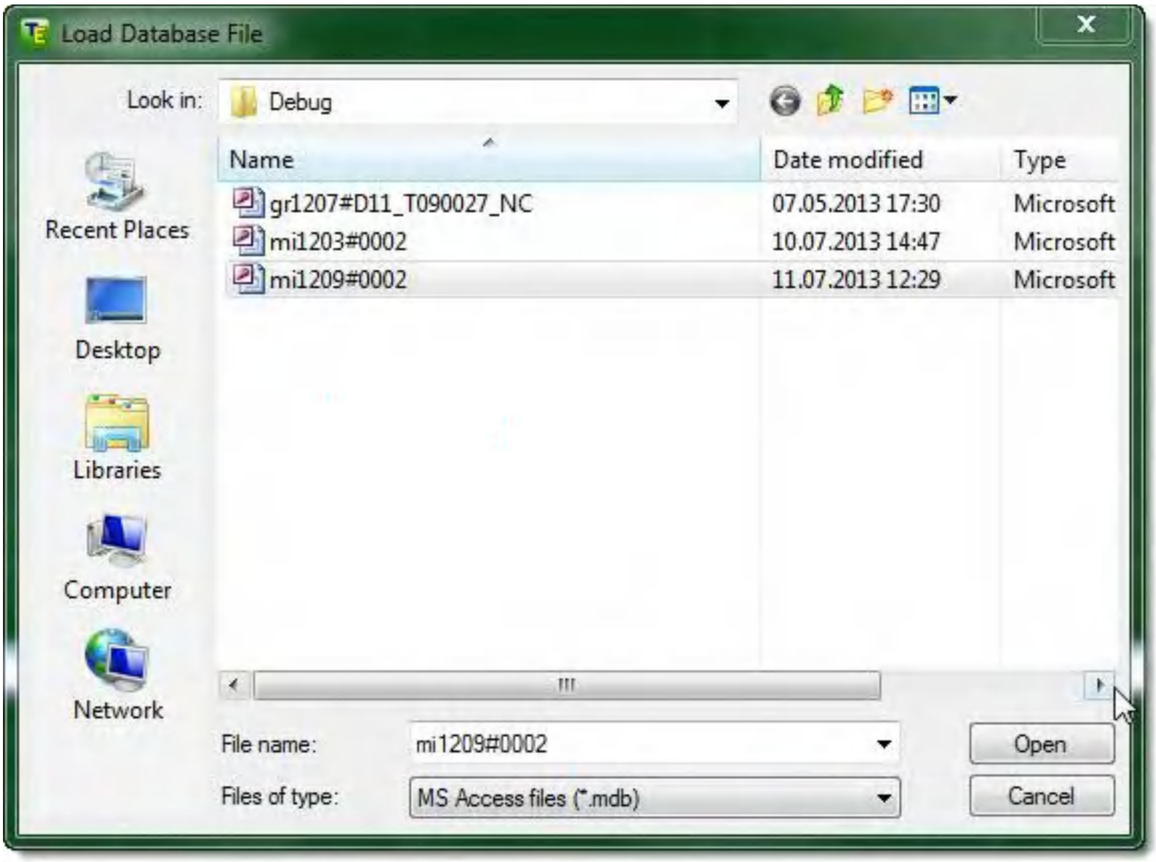

Figure 3

Selecting profile to view

First record (profile) from entire datagrid recordset will be highlighted and selected for viewing when a new database is loaded.

Any other record can be selected, as shown in the figure 4.

	Mark	Local ID	DStart	TStart	TStop	Accum	Wavelen	Polar	Bgd	Zenith	Altitude	Step
0		mi1209#0002.000	2012-09-03	06:21:31	06:23:11	1000	1064.0	0	2.37e+002	0.0	200.0	15.00
1		mi1209#0002.001	2012-09-03	06:21:31	06:23:11	1000	355.0	0	4.12e+002	0.0	200.0	15.00
2		mi1209#0002.002	2012-09-03	06:21:31	06:23:11	1000	532.0	3	1.65e+002	0.0	200.0	15.00
3		mi1209#0002.003	2012-09-03	06:21:31	06:23:11	1000	532.0	2	1.13e+003	0.0	200.0	15.00
4		mi1209#0002.004	2012-09-10	07:39:03	07:46:41	3997	1064.0	0	1.70e+002	0.0	200.0	15.00
5		mi1209#0002.005	2012-09-10	07:39:03	07:46:41	4043	355.0	0	5.93e+002	0.0	200.0	15.00
6		mi1209#0002.006	2012-09-10	07:39:03	07:46:41	4008	532.0	3	1.22e+002	0.0	200.0	15.00
7		mi1209#0002.007	2012-09-10	07:39:03	07:46:41	4003	532.0	2	5.82e+002	0.0	200.0	15.00

	Nonlinear	Nonsync	Sync	Reg Num	Left	Right	Base	RD1	RD2	RG1	RG2	RG3	RP	LR	RE OMT	RE OAT	RE GBS	CIMEL	d-Factor	k-Factor
0	0.000000	0.00	0.00	164	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
1	0.000000	0.00	0.00	161	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
2	0.000000	0.00	0.00	162	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
3	0.000000	0.00	0.00	163	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
4	0.000000	0.00	0.00	164	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
5	0.0[illegible]000	0.00	0.00	161	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
6	0.000000	0.00	0.00	162	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
7	0.000000	0.00	0.00	163	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00

Figure 4

Setting left and right boundaries

Left and right margins of profile can be artificially excluded from processing by use of buttons «Left Stop» and «Right Stop» respectively, as shown in figures 5-8.

Figure 5

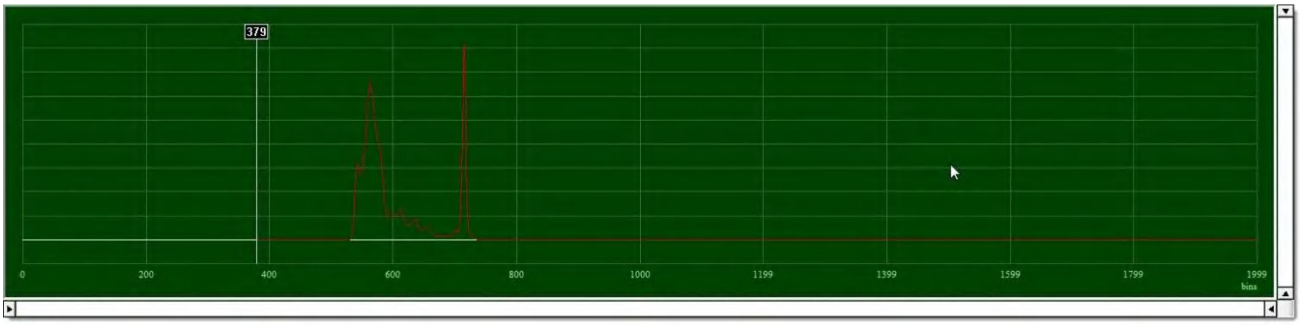

Figure 6

Figure 7

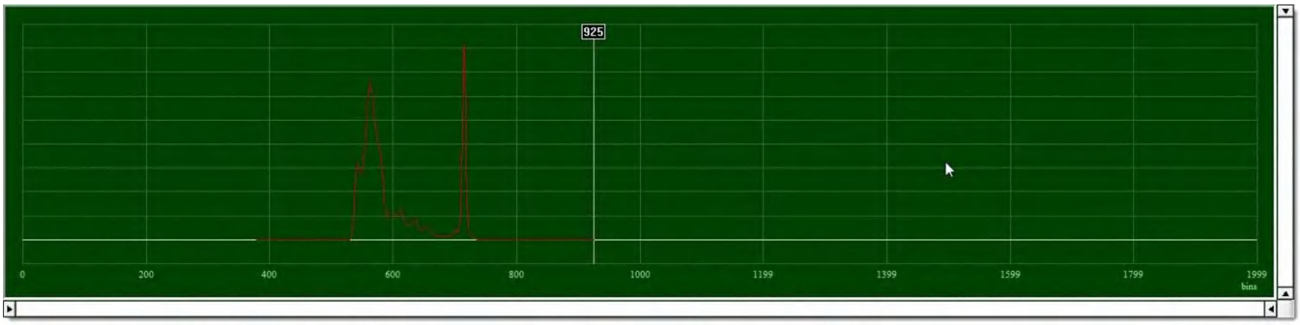

Figure 8

Compare to figure 1.

Changing datagrid field values

Only fields with blue background in datagrid are editable.

At first, let's introduce raw (figure 9) and processed (figure 10) profiles to compare with.

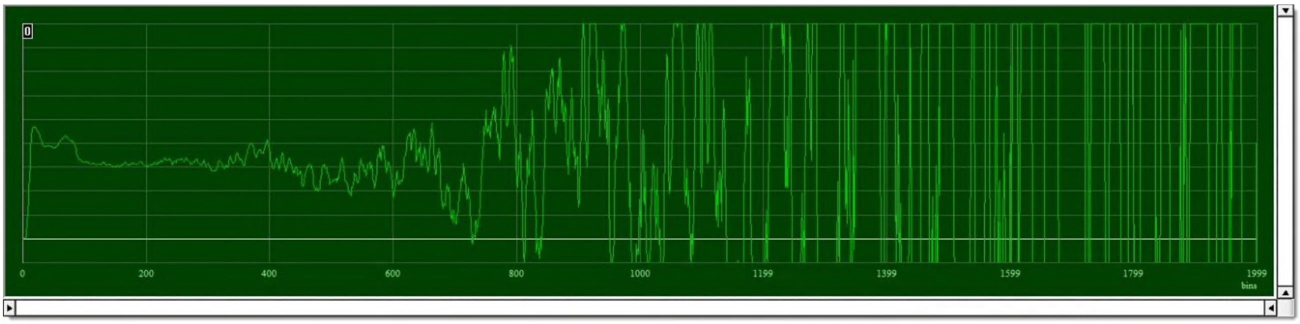

Figure 9

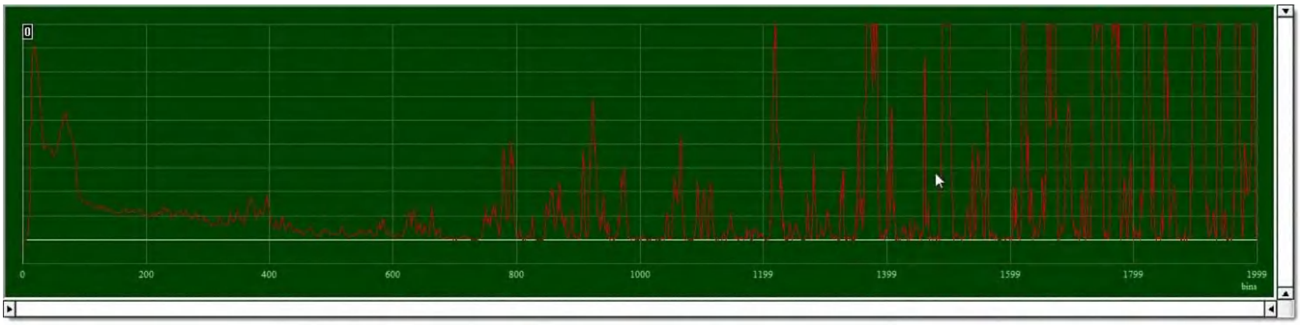

Figure 10

Parameters of photo-receive modules

Photo-receive modules characteristic fields are represented in the figure 11.

Nonlinear	Nonsync	Sync
0.000000	0.00	0.00
0.000000	0.00	0.00
0.000000	0.00	0.00
0.000000	0.00	0.00
0.000000	0.00	0.00

Figure 11

One of the main parameters of the registration of lidar signals is the linearity or nonlinearity of the output characteristics of transformation («Nonlinear» field), i.e., the output signal dependencies from the intensity of light. Linearity of the output characteristic is very important to select the operating mode of photo detectors. This characteristic is measured by a special method for each photo detector module.

The «Sync» field describes "white noise" interferences (figure 12).

The «Nonsync» field describes hardware interferences (figure 12).

Try to play with these values by yourself to see effect.

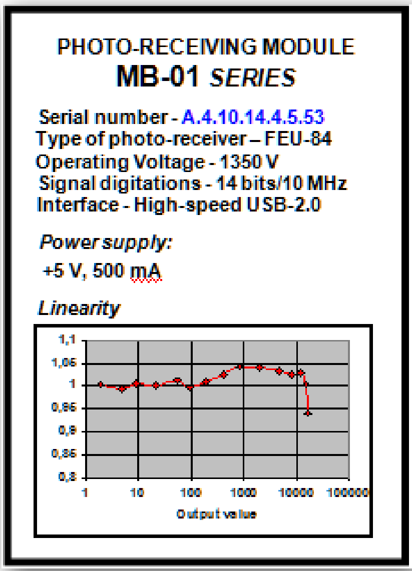

Figure 12

Plot smoothing

Every plot can be smoothed for three regions defined by delimiters (strobe number, bin) «RD1» and «RD2».

Smoothing is carried out on (RGx * 2 + 1) points for each of the regions and carefully sewn together at the delimiters of «RD1» and «RD2», as shown in the figures 13 and 14.

RD1	RD2	RG1	RG2	RG3	RP
199	399	2	4	8	599
199	399	2	4	8	599
199	399	2	4	8	599
199	399	2	4	8	599
300	1200	4	10	20	599
199	399	2	4	8	599
199	399	2	4	8	599
199	399	2	4	8	599

Figure 13

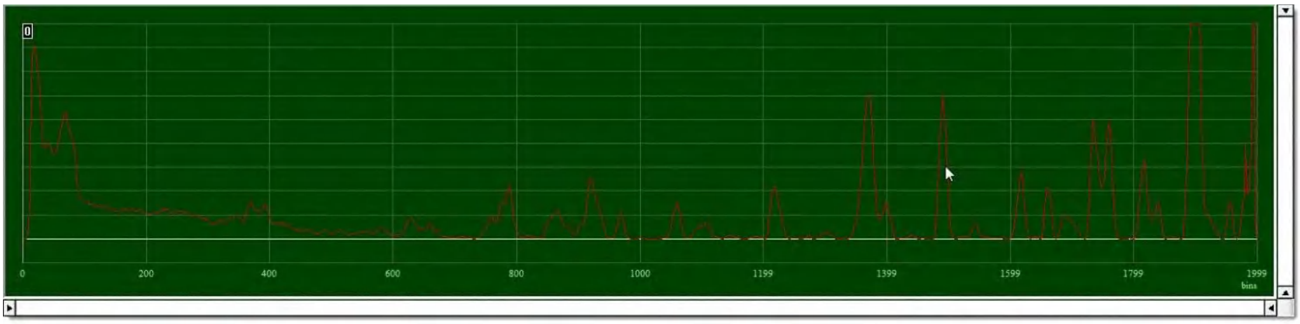

Figure 14

Compare to figure 10.

Base correction

It is possible to adjust the background manually with positive or negative value in the «Base» field, as shown in the figure 15.

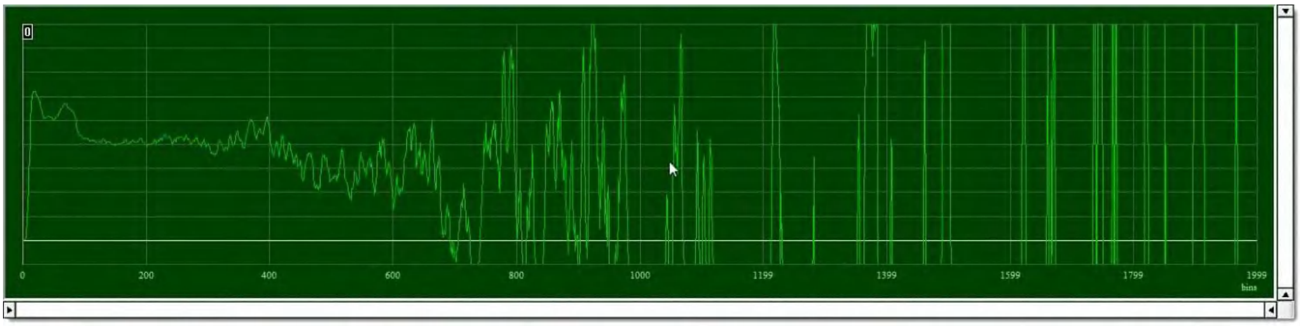

Figure 15

Compare to figure 9.

Reference point and aerosol lidar ratio

The reference point (another words, strobe or bin) «RP» field in the sounding track has to be selected from the following considerations:

- minimum aerosol scattering;
- sufficient accumulation to exclude random noise.

Aerosol lidar ratio «LR» may be changed, if known. By default it is equals to 50.

Relative errors

Estimated relative errors for optical molecular thickness («RE_OMT» field), optical aerosol thickness («RE_OAT» field) and lidar ratio («RE_LR» field) may be specified in the respective columns of the datagrid, as shown in figure 16 (shown values by default).

RE OMT	RE OAT	RE LR
0.10	0.02	0.10
0.10	0.02	0.10
0.10	0.02	0.10
0.10	0.02	0.10
0.10	0.02	0.10

Figure 16

«RE_OAT» field contains total aerosol optical thickness provided by EARLINET sun photometer (or another way) if available, otherwise is equals to 0.2 by default.

Using Gaussian random number generator

The current algorithm may takes into consideration the white noise provided by Gaussian number generator. In this case fields «d-Factor» and «k-Factor» are editable, otherwise – not.

«d-Factor» means amplitude multiplier coefficient for noise values from noise.xls table.

«k-Factor» is amplitude distortion coefficient.

For this kind of correction is necessary to fill columns for all channels in a noise.xls table (attached as a template) from the site http://www.random.org/gaussian-distributions/ or similar one. Be sure to use precise volume of strobes available.

For a detailed understanding should contact the appropriate formula in «Calculating algorithm» topic.

Plot area manipulations

As can be seen from figure 1, two plots are displayed in the top and bottom areas. Manipulations applied to one of the areas are automatically transferred to another.

Bottom area represents plot calculated as:
*(RawSignal - Background) * pow(Distance, 2) / AtmosphereCorrectionCoefficient*.

Top area represents plot calculated as:
Error of Dispersion of Effective Lidar Signal.

Plot normalization

Normalization of plots is performed with respect to their maximum value in the range whose right boundary is defined by special control (figure 17), as shown in the figure 18.

Figure 17

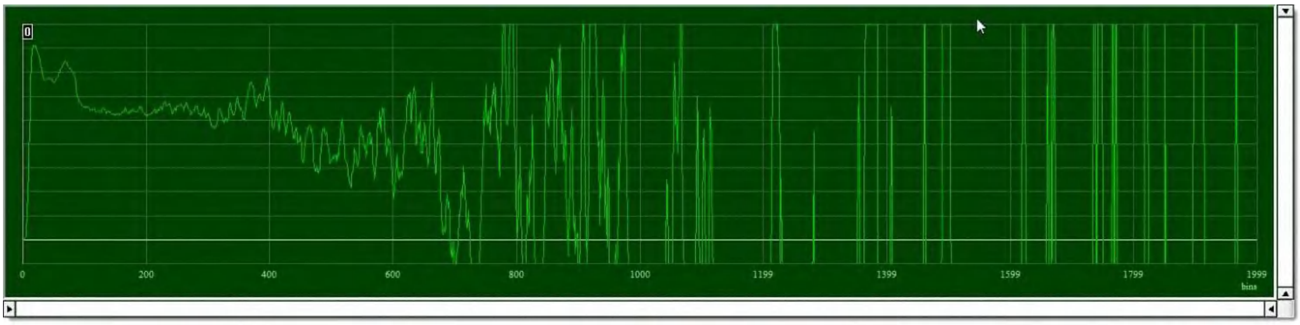

Figure 18

Compare to figure 9.

Quick reper positioning

There are two ways to positioning reper:

1. click the right mouse button to set the reper position directly at the desired point;
2. scroll the mouse wheel to increment or decrement reper position smoothly.

Set restricted field of view

There are two ways to set desired field of view:

1. using sliders in a usual manner;
2. press the left mouse button and hold it down while dragging the mouse to define selection to view the plot, as shown in the figure 19.

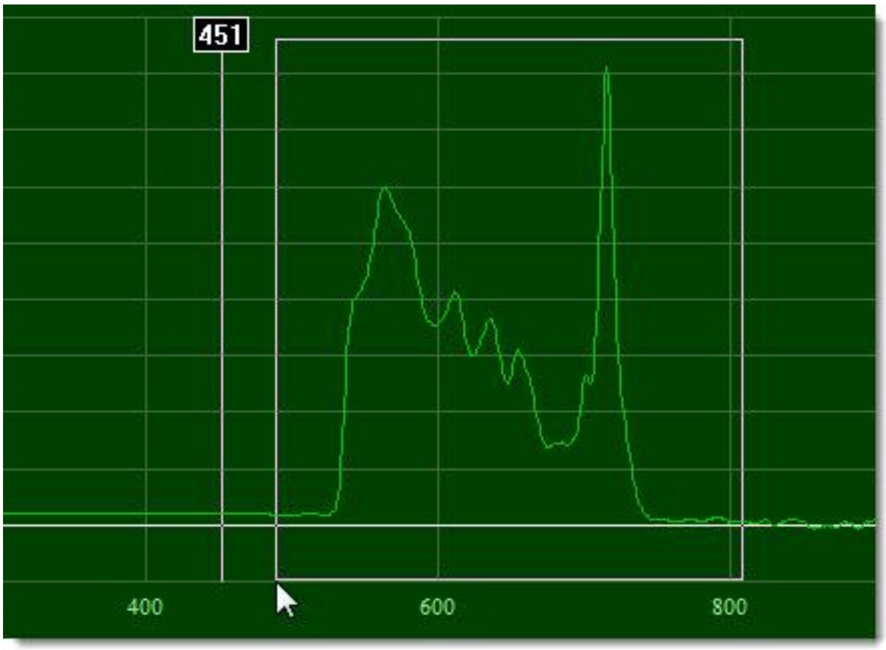

Figure 19

Double click the left mouse button to quickly restore view area to default.

Zero line up and down

Zero line (in white) can be redefined with «Enlarge» (figure 20) and «Shrink» (figure 21) buttons, as shown in the figure 22.

Figure 20

Figure 21

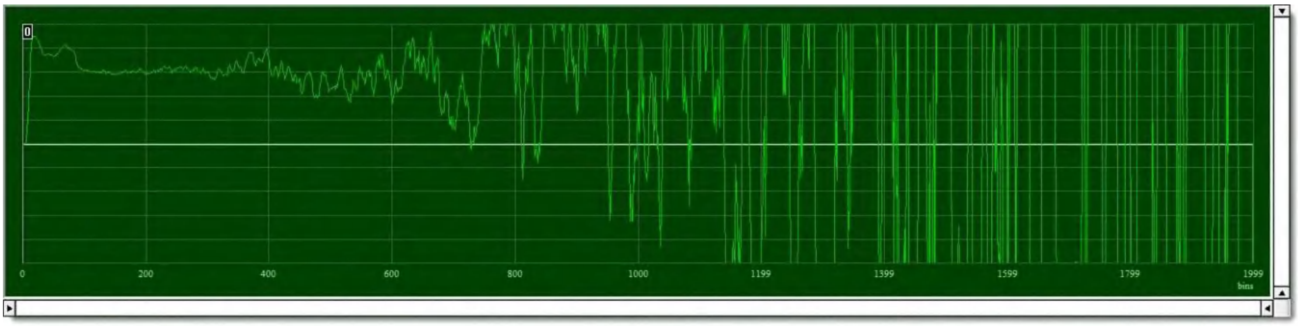

Figure 22

This feature is very useful for observing the behavior of the signal's tail around zero line.

Compare to figure 9.

Selecting atmosphere model

Press «Select Model» button (figure 23) to choose the desired atmosphere model (figure 24).

Figure 23

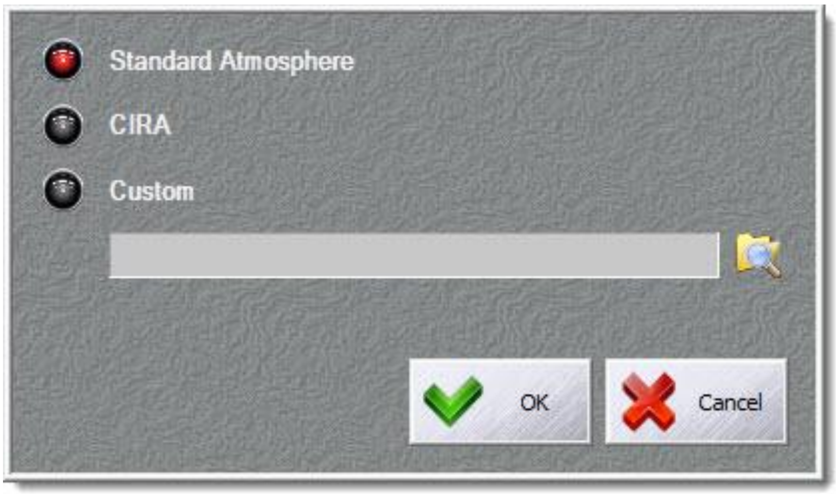

Figure 24

Note that custom model may be used if own meteo station available. In such a case Excel spreadsheet should be prepared as per CIRA.xls.

Error dispersion profiles will be recalculated in real-time mode.

Calculating algorithm

The algorithm was developed by:

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Input signal

Main definitions:

Raw signal plus background. May be joined or averaged profile obtained by «Synthesizer» program: $P_j^*(n)$

Background signal: B_j^*

The beginning and the end strobe numbers of measured array: $N1$ and $N2$

Strobe number n from the flash moment: $n^0 = n - N1$

Left N_j1 and right N_j2 boundaries as described in topic «Setting left and right boundaries».

Calculated signal

$$S_j^*(n) = rel(n) \times \left(1 - \frac{(N_{ref} - n) \times k\_factor}{N_{ref}}\right) \times \left(\hat{P}_j^*(n^0 = n - N_1) - B_j^* - base + delta(n) \times d\_factor\right) \times (n \times |\Delta z|)^2$$

If using Gaussian random number generator «d-Factor» and «k-Factor» will be taken from datagrid, otherwise equals to zero.

«base» is additional compensation background (if needed) taken from datagrid.

The signal is already smoothed as described in the topic «Plot smoothing».

«rel(n)» and «delta(n)» are taken from «noise.xls» spreadsheet, otherwise equals to 1.

Reference point

Set reference point as described in the topic «Reference point».

It can be placed outside boundaries N_j1 and N_j2.

Reference point value calculates as:

$$\hat{S}_j(n = N_{rep,j}) = \frac{1}{21} \times \sum_{n^0 = N_{rep,j} - N_1 - 10}^{n^0 = N_{rep,j} - N_1 + 10} \hat{P}_j^*(n) \times (n \times |\Delta z|)^2$$

Molecular model of atmosphere

Molecular model of atmosphere calculates as:

$$\beta_{m,j}(n) = \beta_{m,j}(h=0) \times d_m(ns \times \cos(Z_0) + H0) / d_m(0)$$

where Z_0 is the angle between the vertical and the main axis sensing (current angle for synthesized profile).

Optical molecular thickness

Optical molecular thickness inside [n - N_j] interval calculates as:

if $n < N_j$

$$\tau_{m,j}(z_n, z_N) = \sum_{i=n+1}^{i=N_j} p_m \times \beta_{m,j}(z_i) \times \Delta z_i \times \frac{CosZ_0}{CosZ_i} = \sum_{i=n+1}^{i=N_j} p_m \times \beta_{m,j}(z_i) \times |\Delta z| \times \frac{CosZ_0}{CosZ_i}$$

if $n > N_j$

$$\tau_{m,j}(z_n, z_N) = \sum_{i=N_j}^{i=n-1} p_m \times \beta_{m,j}(z_i) \times \Delta z_i \times \frac{CosZ_0}{CosZ_i} = \sum_{i=N}^{i=n-1} p_m \times \beta_{m,j} \times |\Delta z| \times \frac{CosZ_0}{CosZ_i}$$

if $n = N_j$

$$\tau_{m,j}(z_n, z_N) = 0$$

Calculating profile of molecular extinction

Molecular extinction coefficient $\sigma_{m,j}(z_n,\lambda)$ for channel j at a distance $l_n = ns$ calculates as:

$$\sigma_{m,j}(z_n,\lambda) = 287.05287 \times C_s(\lambda) \times \hat{d}_m \times (ns \times \cos(Z_0) + H_0)$$

where

$H_n = ns \times \cos(Z) + H_0)$ - strobe height;

Z - zenith angle;

H_0 - altitude over sea level;

$\hat{d}_m(H_n)$ - molecular atmosphere density taken from standard or CIRA model.

$C_s(\lambda)$ parameter defined as:

$$C_s(\lambda) = 0.01(a + b \times \lambda^c)^{-\frac{1}{d}} \qquad [K/(Pa \times m)]$$

$$\lambda[nm]$$

a= -21.693798344267826

b= 0.00087342438635830215

c= 2.2366776150227192

Calculating molecular optical thickness

Molecular optical thickness $\tau_{m,j}(z_n, z_N)$ inside range $\lfloor n - N_j \rfloor$ calculates as:

if $n \langle N_j$

$$\tau_{m,j}(z_n, z_N) = \sum_{i=n+1}^{i=N_j} \sigma_{m,j}(z_i, \lambda) \times \Delta z_i \times \frac{CosZ_0}{CosZ_i} = \sum_{i=n+1}^{i=N_j} \sigma_{m,j}(z_i, \lambda) \times |\Delta z| \times \frac{CosZ_0}{CosZ_i}$$

if $n \rangle N_j$

$$\tau_{m,j}(z_n, z_N) = \sum_{i=N_j}^{i=n-1} p_m \times \beta_{m,j}(z_i) \times \Delta z_i \times \frac{CosZ_0}{CosZ_i} = \sum_{i=N}^{i=n-1} \sigma_{m,j}(z_i, \lambda) \times |\Delta z| \times \frac{CosZ_0}{CosZ_i}$$

if $n = N_j$

$$\tau_{m,j}(z_n, z_N) = 0$$

Calculating molecular lidar backscatter ratio

$$P_m(\lambda) = \frac{8\pi}{3} \times k_{C,T}(\lambda, \Delta\lambda)$$

where

$k_{C,T}(\lambda, \Delta\lambda)$ - correction factor which takes into account rotation Raman component of the lidar signal:

$$k_{C,T}(\lambda, \Delta\lambda) = k_C(\lambda) - \Delta k(\lambda) \times W(\lambda, \Delta\lambda)$$

$k_C(\lambda), \Delta k$ defined as:

$$k_C(\lambda) = \sqrt{a_1 + a_2\lambda^2 + \frac{a_3}{\lambda^2} + \frac{a_4}{\lambda^4}}$$

where:

a_1 = 1.0779363729155738

a_2 = -1.4114618324124403E-11

a_3 = 896.96823089693635

a_4 = 52062355.046277404

$$\Delta k(\lambda) = a \times \lambda^{b+\frac{c}{\lambda}} + d$$

where:

a= 5.371109819764088

b= -1.48754255361213716

c= 81.002440828712594

d= 0.024633566682161448

$W(\lambda,\Delta\lambda)$ parameter calculates as:

$$W(\lambda,\Delta\lambda) = W(x\ \ ) = 1 - \exp\left(-\frac{x^2}{3528}\right)$$

where:

$$x\ \ = 10^7\left(\frac{1}{\lambda} - \frac{1}{\lambda + \frac{\Delta\lambda}{2}}\right)$$

$\Delta\lambda$ - spectral bandwidth of interference filter taken from Config_ID.xls spreadsheet.

Calculating profile of molecular backscatter

$$\beta_m(z_n,\lambda) = \frac{1}{P_m(\lambda)} \times \sigma_{m,j}(z_n,\lambda)$$

Calculating profile of effective lidar signal

$$L^*\left(\lambda_j, z_n\right) \equiv \mathbf{L}^*\left(\lambda_j, z_n, \mathrm{R}_\mathrm{N}, S^*\left(\lambda_j, z_n\right)\right) = \frac{\left(P_j^*(n) - B_j^*\right)\left(n|\Delta z|\right)^2}{\hat{S}(N)} R_j(z_N)\exp(-2\tau_{m,j}(z_n, z_N))$$

Calculating profile of backscatter lidar ratio

$$\hat{R}(\lambda_j, z_n) \approx S^*(\lambda_j, z_n, z_N) \times R_j(z_N) \exp(-2\tau_{m,j}(z_n, z_N)) \frac{\beta_m^j(z_N)}{\beta_m(\lambda_j, z_n)} \times$$

$$\times \exp\left(-2\hat{p}|\Delta z| \sum_{i=z_N}^{i=z_n-1} \left(\hat{R}(\lambda_j, z_i) - 1\right) \times \beta_m(\lambda_j, z_i) \right)$$

where:

Δ , χ , $\hat{p}$ and μ are defined in «prm.ini» file (see below).

by default:

molecular scatter depolarization

$$\chi(\lambda_j = 532nm) = \frac{\beta_{\perp m}(\lambda_2, z_n)}{\beta_{\Uparrow m}(\lambda_3, z_n)} \approx 0.014;$$

aerosol scatter integral depolarization

$$\Delta = 0.1$$

hardware polarization degree

$\mu = 0.02$ (by default)

$\hat{p}_j = 50$ (by default) - aerosol lidar ratio, depends of polarization:

$polar = 0$ => $\hat{p}_j = p$

$polar = 1$ => $R = 1$

$polar = 2$ => $\hat{p}_j = \frac{1+\Delta}{1+\chi} \frac{\chi+\mu}{\mu+\Delta} p$

$polar = 3$ => $\hat{p}_j = \frac{1+\Delta}{1+\chi} p$

Calculating profile of effective lidar signal error dispersion

$$\Omega_L^j(z_n,z_n)=\left\langle \delta_{L,n}^j \delta_{L,n}^j \right\rangle \approx S^{*2}\left(\lambda_j,z_n,z_N\right)\exp(-4\tau_{m,j}(z_n,z_N))\times$$
$$\times\left(\frac{\left\langle \delta^2(S_n^{*j})\right\rangle}{\left(S_n^{*j}\right)^2}+\frac{\left\langle \delta^2(\hat{R}(\lambda_j,z_N))\right\rangle}{\left(\hat{R}(\lambda_j,z_N)\right)^2}+\frac{\left\langle \delta^2(\beta_m(\lambda_j,z_N))\right\rangle}{\left(\beta_m(\lambda_j,z_N)\right)^2}+\frac{\left\langle \delta^2(\hat{\beta}(\lambda_j,z_n,C_v(z_n)))\right\rangle}{\left(\hat{\beta}(\lambda_j,z_n,C_v(z_n))\right)^2} + 4\left\langle \delta^2(\tau_{m,n}(\lambda_j))\right\rangle+4\left\langle \delta^2(\hat{\tau}_{a,n}(\lambda_j,z_N,C_v(z_n)))\right\rangle\right)$$

where:

$$\frac{\left\langle \delta^2(S_n^*)\right\rangle}{\left(S_n^*\right)^2}=v^2+\frac{q^2 N^*{}_j(n)}{A\ (2M+1)\ \left(N_j^*(n)-F_j^*\right)^2}+\frac{u^2}{\left(N_j^*(n)-F_j^*\right)^2(2M+1)}$$

v - nonlinerity

q - nonsynchron noise

u - synchron noise ($u^2=0$ for photon counters)

Relative square deviation of lidar backscatter ratio in reference point (0.0004 by default):

$$\frac{\left\langle \delta^2(\hat{R}(\lambda_j,z_N))\right\rangle}{\left(\hat{R}(\lambda_j,z_N)\right)^2}=\text{re2\_bsr\_ref}$$

Relative square deviation of molecular backscatter in reference point (0.0004 by default):

$$\frac{\left\langle \delta^2(\beta_m(\lambda_j,z_N))\right\rangle}{\left(\beta_m(\lambda_j,z_N)\right)^2}=\text{re2\_ms\_ref}$$

Relative square deviation of lidar ratio:

$$\frac{\left\langle \delta^2(\hat{\beta}(\lambda_j, z_n, C_v(z_n)))\right\rangle}{\left(\hat{\beta}(\lambda_j, z_n, C_v(z_n))\right)^2} = \theta^2(\lambda_j)\frac{\left(\hat{R}(\lambda_j, z_n)-1\right)^2}{\hat{R}^2(\lambda_j, z_n)} + \frac{\mathrm{re2\_ms\_ref}}{\hat{R}^2(\lambda_j, z_n)}$$

where

$\theta(\lambda_j) = \mathrm{re\_gbs}$ - relative error of lidar ratio (0.05 by default).

Estimation error of optical molecular thickness (ReOMT = 0.1 by default):

$$\delta(\tau_{m,n}(\lambda_j)) = \mathrm{Re}\,OMT \times \tau_{m,n}(\lambda_j)$$

Estimation error of optical aerosol thickness (ReOAT = 0.02 by default):

$$\delta(\tau_{m,n}(\lambda_j)) = \mathrm{Re}\,OAT \times \left|\frac{z_N - z_n}{z_N}\right|$$

Saving results

It’s possible to process multiple profiles at once. Simply fill «Mark» field with any number (figure 25 and 26).

	Mark	Local ID	DStart	TStart	TStop	Accum	Wavelen	Polar	Bgd	Zenith	Altitude	Step	Nonlinear
0	1	mi1209#0002.000	2012-09-03	06:21:31	06:23:11	1000	1064.0	0	2.37e+002	0.0	200.0	15.00	0.000000
1		mi1209#0002.001	2012-09-03	06:21:31	06:23:11	1000	355.0	0	4.12e+002	0.0	200.0	15.00	0.000000
2	1	mi1209#0002.002	2012-09-03	06:21:31	06:23:11	1000	532.0	3	1.65e+002	0.0	200.0	15.00	0.000000
3		mi1209#0002.003	2012-09-03	06:21:31	06:23:11	1000	532.0	2	1.13e+003	0.0	200.0	15.00	0.000000
4	1	mi1209#0002.004	2012-09-10	07:39:03	07:46:41	3997	1064.0	0	1.70e+002	0.0	200.0	15.00	0.000000
5		mi1209#0002.005	2012-09-10	07:39:03	07:46:41	4043	355.0	0	5.93e+002	0.0	200.0	15.00	0.000000
6	1	mi1209#0002.006	2012-09-10	07:39:03	07:46:41	4008	532.0	3	1.22e+002	0.0	200.0	15.00	0.000000
7		mi1209#0002.007	2012-09-10	07:39:03	07:46:41	4003	532.0	2	5.82e+002	0.0	200.0	15.00	0.000000

	Nonsync	Sync	Reg Num	Left	Right	Base	RD1	RD2	RG1	RG2	RG3	RP	LR	RE OMT	RE OAT	RE GBS	CIMEL	d-Factor	k-Factor
0	0.00	0.00	164	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
1	0.00	0.00	161	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
2	0.00	0.00	162	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
3	0.00	0.00	163	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
4	0.00	0.00	164	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
5	0.00	0.00	161	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
6	0.00	0.00	162	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
7	0.00	0.00	163	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00

Figure 25

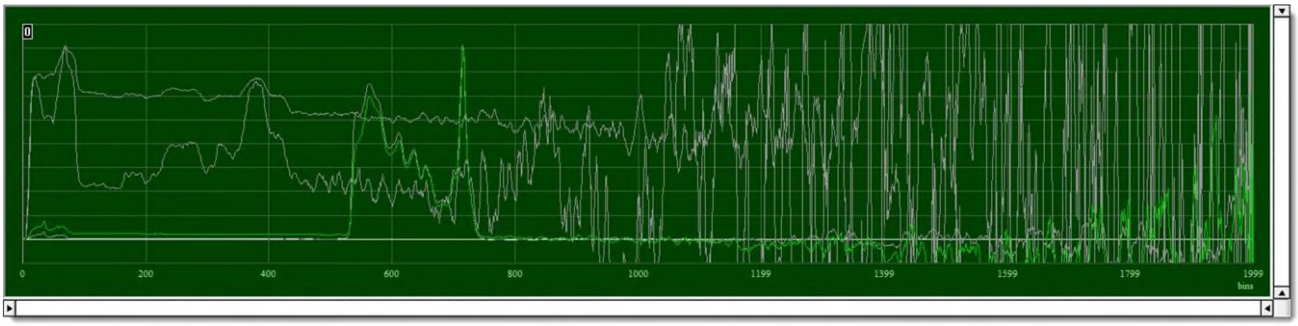

Figure 26

Press «Save DB» button (figure 27) and select format to save (figure 28).

Figure 27

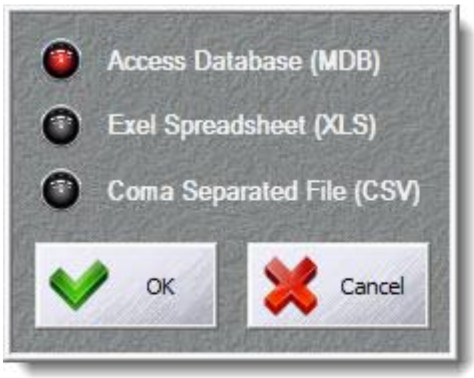

Figure 28

There are two ways to store processed data:

1. into original database;
2. or/and export to Excel spreadsheet.

PS: CSV files currently not supported due to very large volume.

Important: while saving into the original database take into account that:

- an unlimited number of processed profiles with different parameters can be stored;
- first time processed profile stores into the original record;
- other ones are stored as additional records (not editable, but with own ID) appended to the end and marked with light green background, so it's possible to compare different conditions of processing (figure 29).

	Mark	Local ID	DStart	TStart	TStop	Accum	Wavelen	Polar	Bgd	Zenith	Altitude	Step	Nonlinear	Nonsync	Sync	Reg Num	Left	Right	Base	RD1	RD2	RG1	RG2	RG3	RP	LR	RE OMT	RE OAT	RE GBS	CIMEL	d-Factor	k-Factor
257		mi1203#0002.257	2012-03-26	07:26:38	07:59:59	20000	1064.0	0	1.70e+002	0.0	200.0	15.00	0.000001	0.05	0.50	164	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
258		mi1203#0002.258	2012-03-26	07:26:38	07:59:59	20000	532.0	2	4.64e+002	0.0	200.0	15.00	0.000001	0.05	0.50	163	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
259		mi1203#0002.259	2012-03-26	07:26:38	07:59:59	20000	532.0	3	1.19e+002	0.0	200.0	15.00	0.000001	0.05	0.50	162	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
260		mi1203#0002.260	2012-03-26	07:26:38	08:00:00	20000	355.0	0	4.82e+002	0.0	200.0	15.00	0.000010	0.10	1.00	161	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
261		mi1203#0002.000.01	2012-03-05	08:22:56	08:31:42	5261	1064.0	0	1.65e+002	0.0	200.0	15.00	0.000001	0.05	0.50	164	0	1999	0.00	199	399	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
262		mi1203#0002.000.01	2012-03-05	08:22:56	08:31:42	5261	1064.0	0	1.65e+002	0.0	200.0	15.00	0.000001	0.05	0.50	164	0	1999	0.00	300	600	24	8	16	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
263		mi1203#0002.000.02	2012-03-05	08:22:56	08:31:42	5261	1064.0	0	1.65e+002	0.0	200.0	15.00	0.000001	0.05	0.50	164	0	1999	0.00	300	600	0	0	0	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00
264		mi1203#0002.000.03	2012-03-05	08:22:56	08:31:42	5261	1064.0	0	1.65e+002	0.0	200.0	15.00	0.000001	0.05	0.50	164	0	1999	0.00	300	600	2	4	8	599	50.00	0.10	0.02	0.10	0.20	0.00	0.00

Figure 29

After saving the «Mark» field will be filled in pink background.

Combined records created by «Synthesizer» program are marked with yellow background in the same field.

Getting program version

Press «About» button (figure 30) and discover current program version (figure 31).

Figure 30

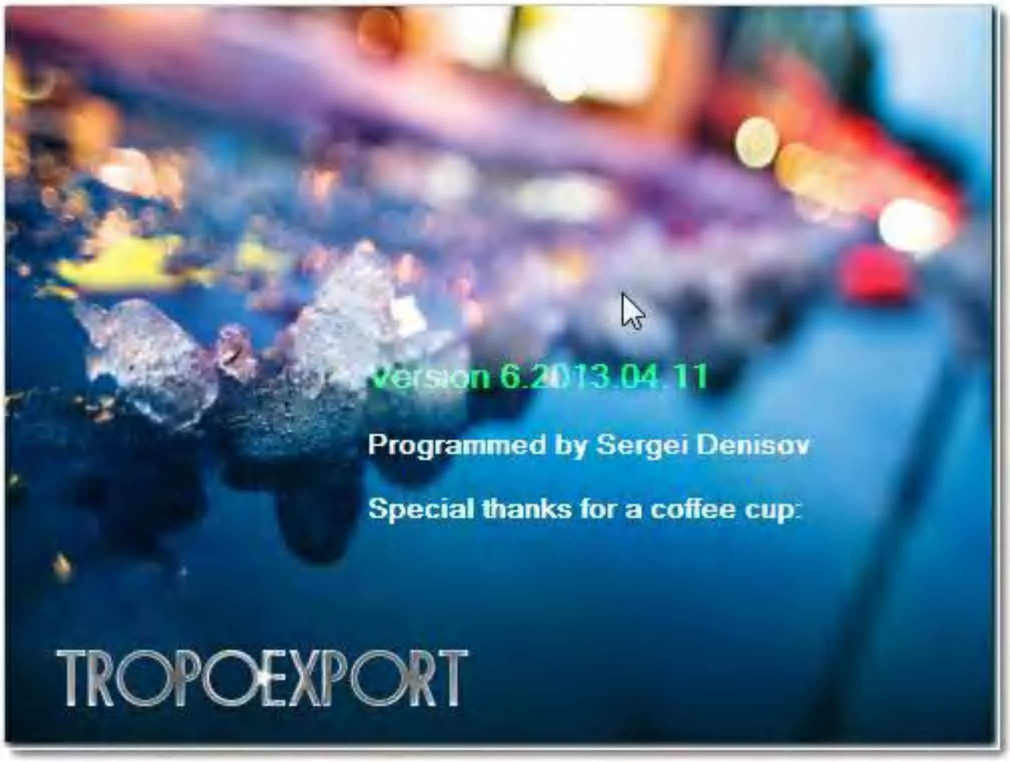

Figure 31

Predefine values and coefficients for calculations

While first time starting program «prm.ini» file will be created automatically.

It consists of a number important predefined parameter in specific sections that can be modified manually.

[LOCATION]

manager_ID=cha (Chaikovsky, for example)

manager_location=mi (Minsk)

executive_ID=0001 (operator's ID)

[PARAMETERS]

reference_point=599

lidar_ratio_mol=8.739425 (molecular lidar ratio)

lidar_ratio_aero=50.000000 (aerosol lidar ratio)

delta=0.100000 (see topic «Calculating profile of backscatter lidar ratio»)

hi=0.014000 (the same)

mu=0.020000 (the same)

re_oat=0.020000 (see topic «Calculating profile of effective lidar signal error dispersion»)

re_omt=0.100000 (the same)

re_gbs=0.100000 (the same)

re2_bsr_ref=0.000400 (the same)

re2_ms_ref=0.000400 (the same)

cimel_ot=0.200000 (optical thickness measured by sun photometer)

noise=1 (using Gaussian random number generator, 0 – not using)

rd1=199 (first smoothing delimiter)

rd2=399 (second smoothing delimiter)

rg1=2 (first smoothing gate)

rg2=4 (second smoothing gate)

rg3=8 (third smoothing gate)