

**WHY RESIDUALS
CAN BE USEFUL
IN REAL ESTATE VALUATION**

Author: dr eng. Małgorzata Renigier - Biłozor
E-mail: malgorzata.renigier@uwm.edu.pl

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INTERPRETATION of RESIDUALS

Residuals as a simplified representative of stochastic factors exerting influence on real estate value

$$e_i = y_i - f(x_i, \beta_i)$$

Empirical value

Value from a model

RESIDUALS

error in statistical
analyses

unpredictable of the systems
reactions

(evidence of random processes and
uncertainty)

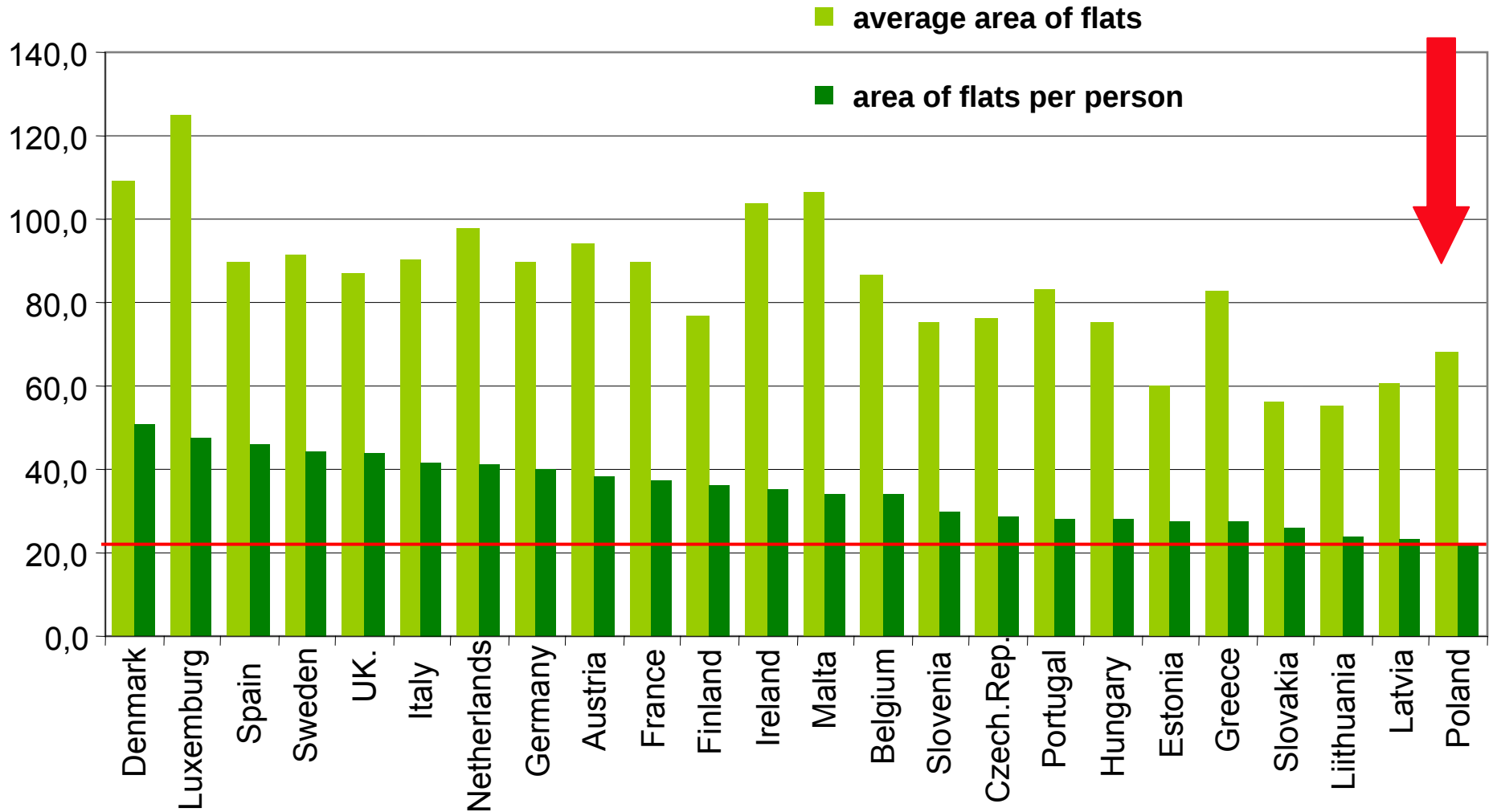


FIRST THOUGHT about APPLICATION of RESIDUALS

Reasons for developing different method for mass appraisal of real estate

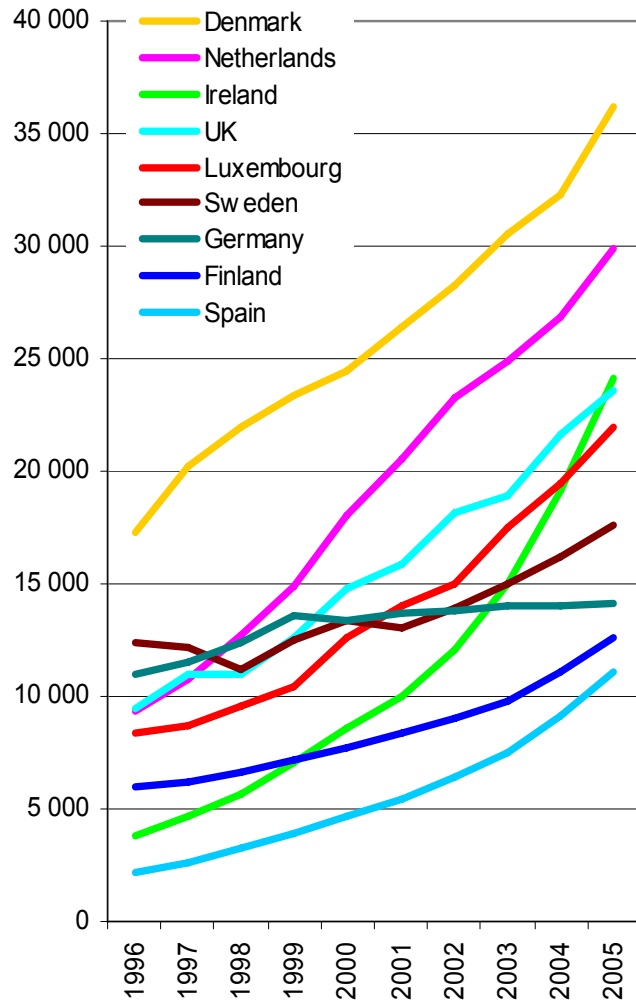
- failure in the use of the linear regression (classical method)
 - not only the causal-effect of dependence on the market
 - low predictability of the reliable real estate value
- huge changes in the real estate market in Poland
 - the growth of interest in the mass appraisal of real estate in Poland
 - government - studies on the mass appraisal for tax load aims



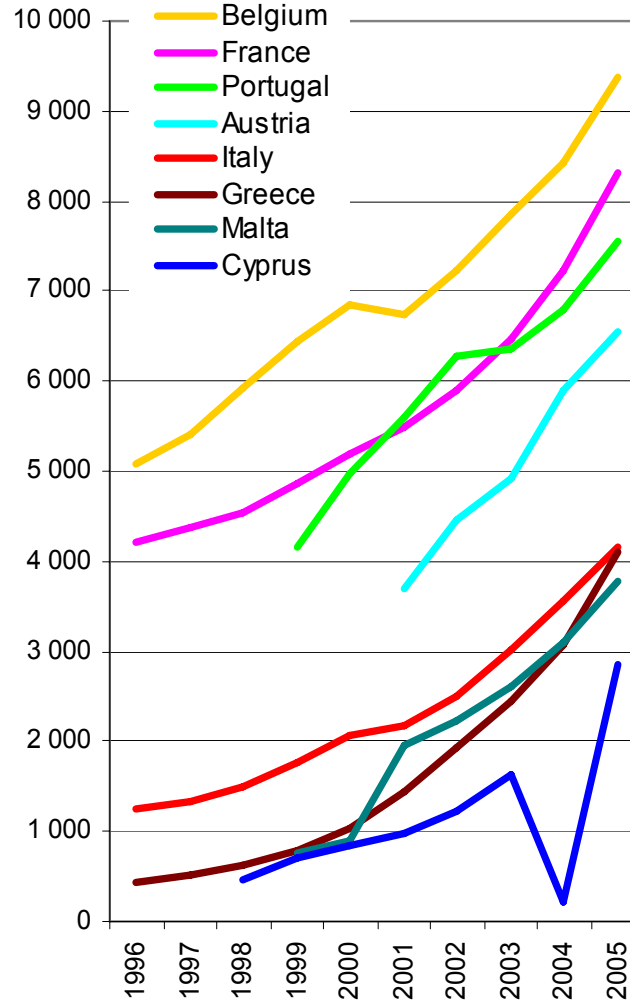


POLAND and UE MORTGAGE DEBTS (EURO per person)

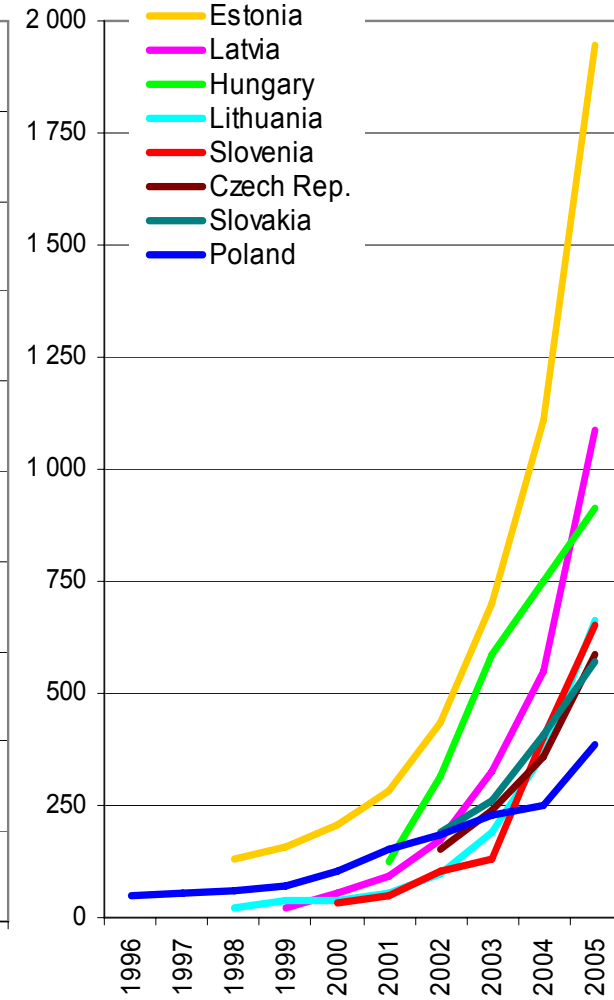
ABOVE 10.000 €



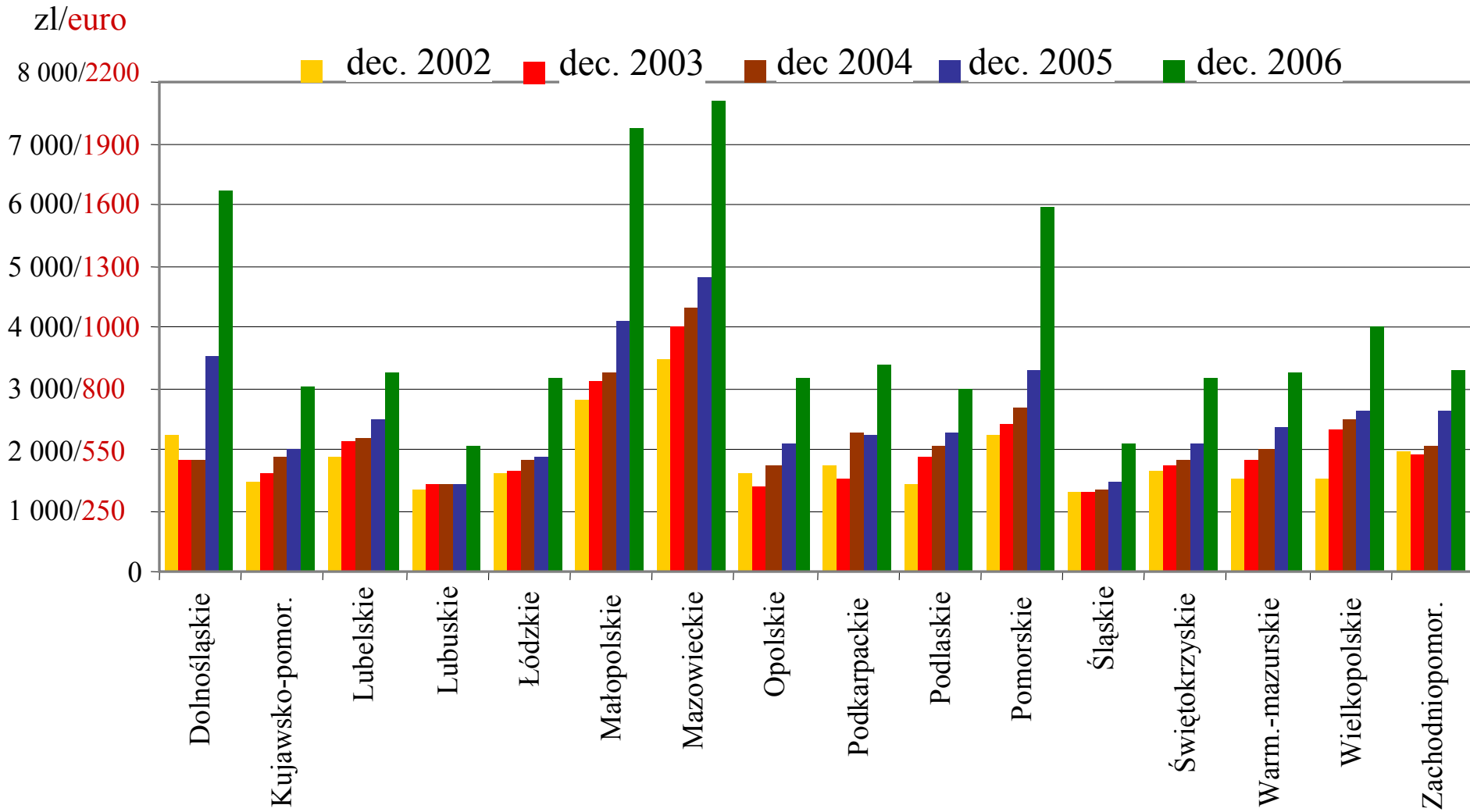
2.000 - 10.000 €



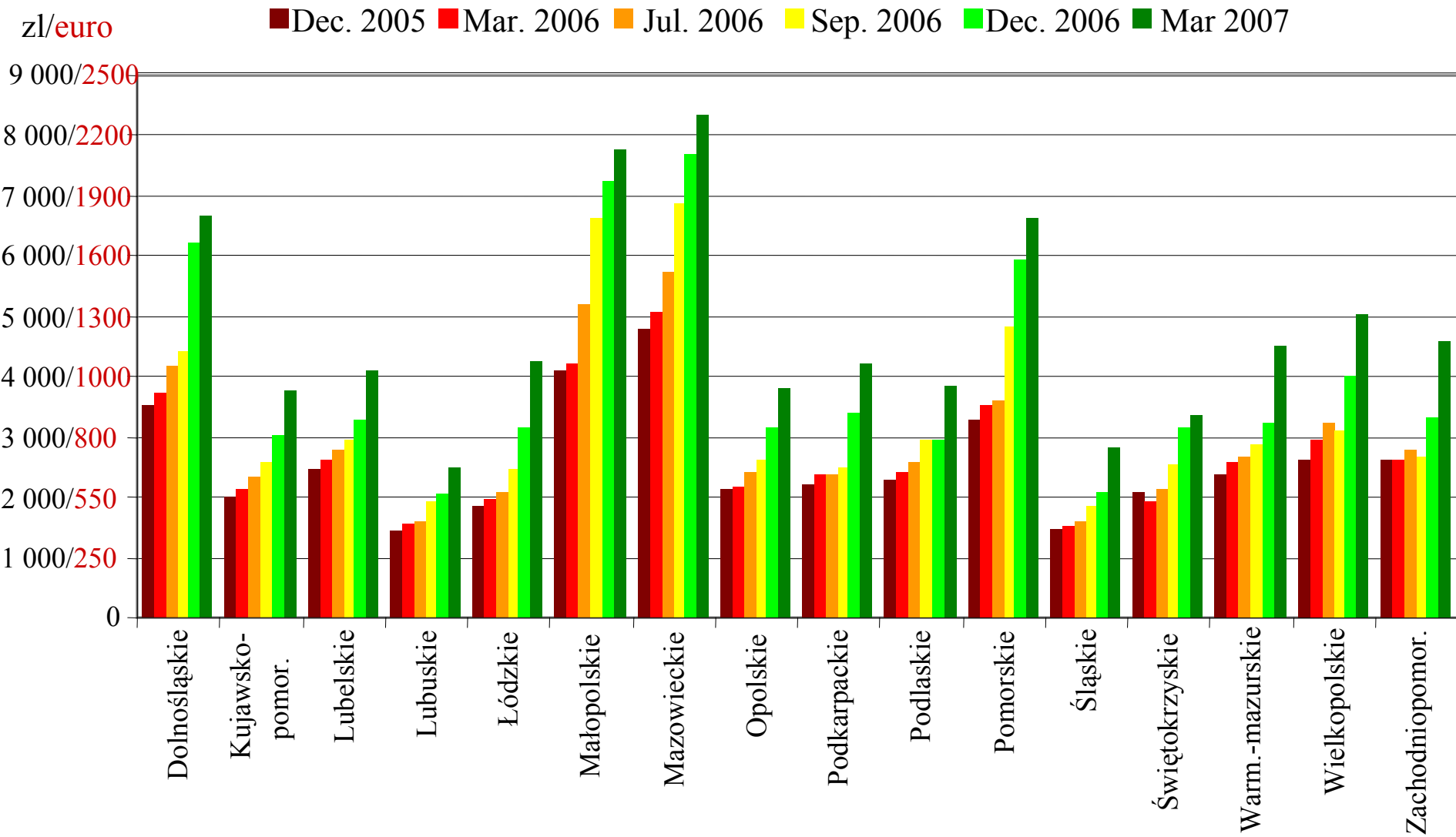
BELOW 2.000 €



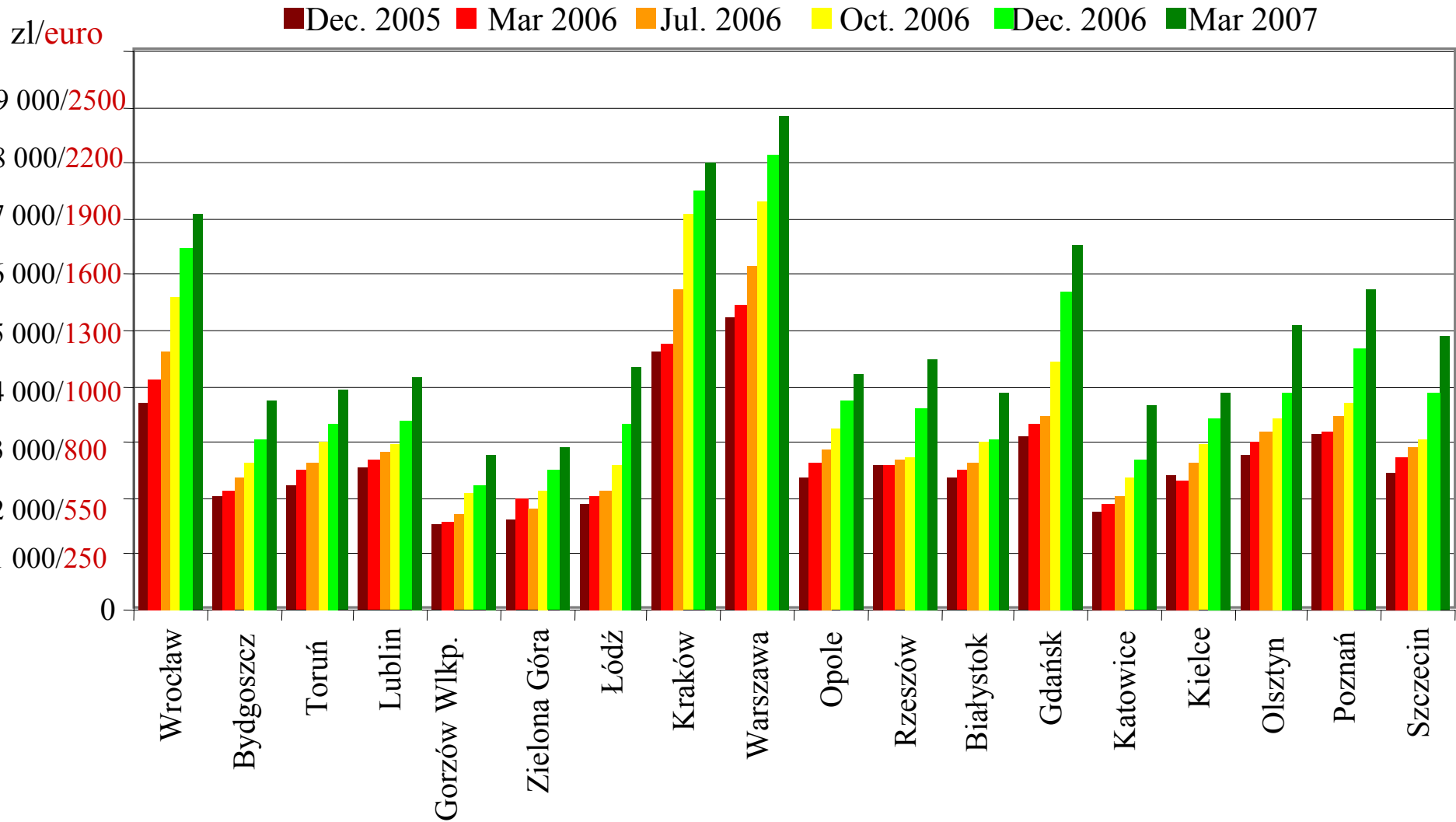
THE PRICES OF FLATS ON THE SECONDARY MARKET



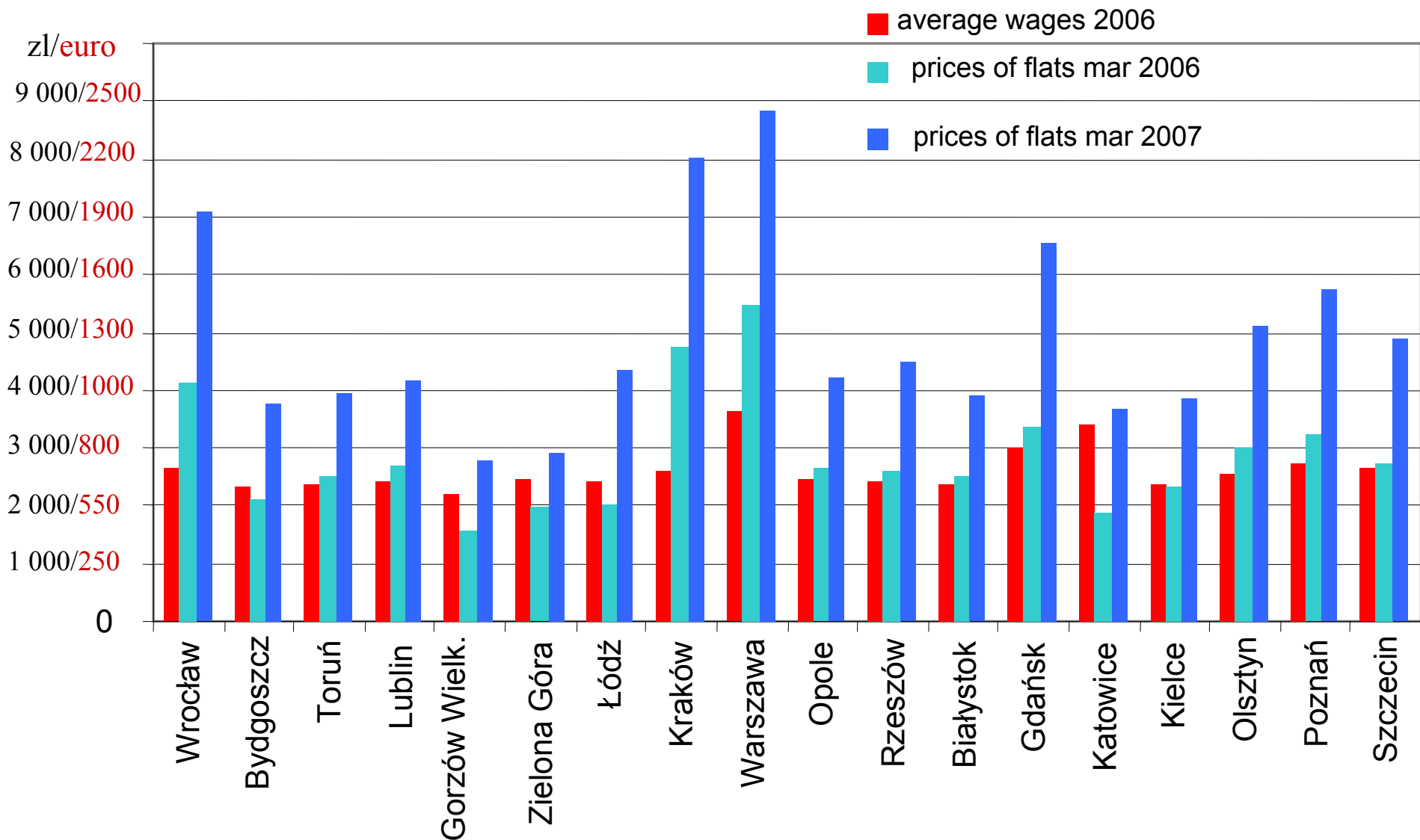
THE PRICES OF FLATS ON THE SECONDARY MARKET



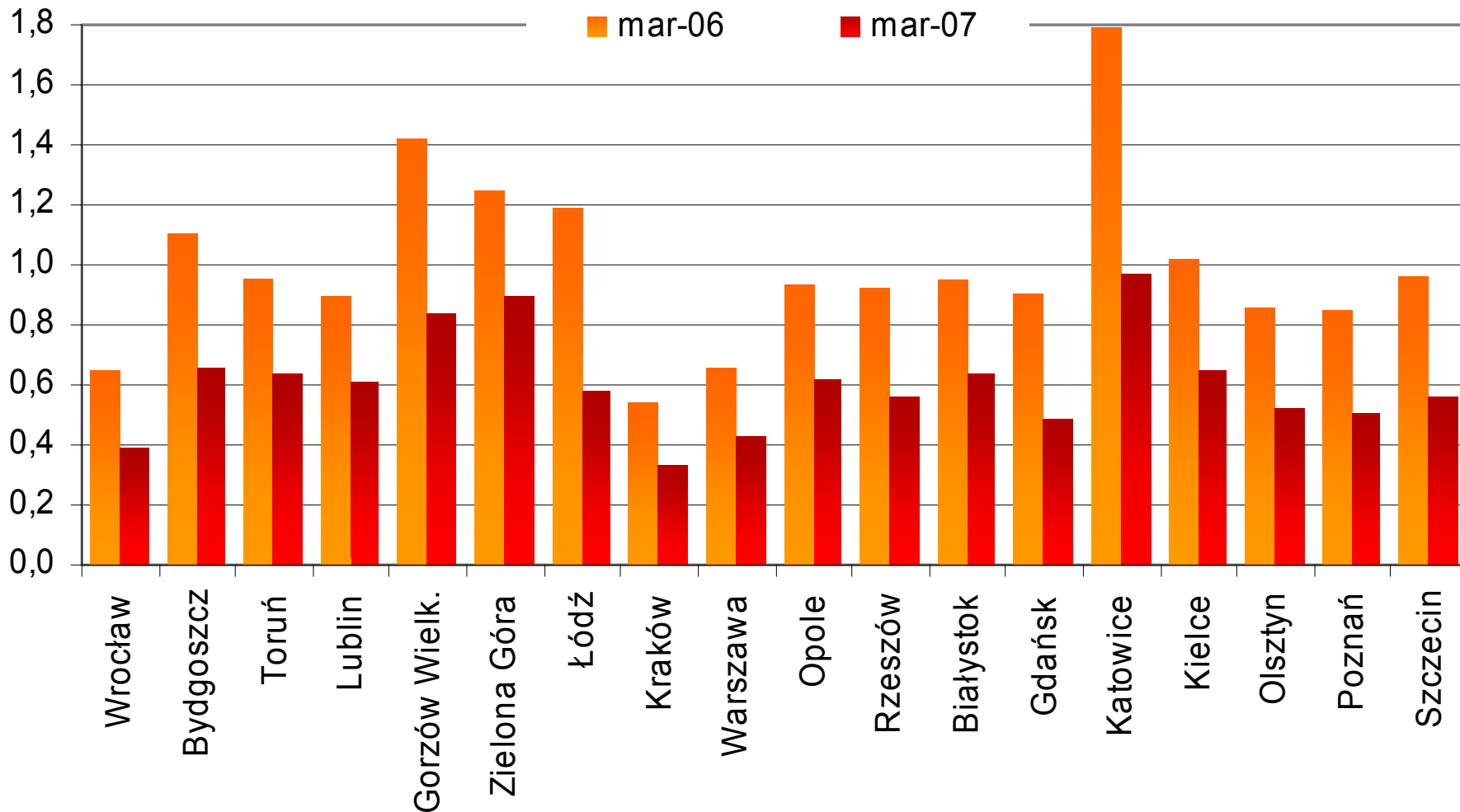
THE PRICES OF FLATS ON THE SECONDARY MARKET



AVERAGE WAGES AND PRICES OF FLATS ON THE SECONDARY MARKET



THE AREA OF THE FLAT, WHAT CAN BE PURCHASED FOR AVERAGE GROSS WAGES

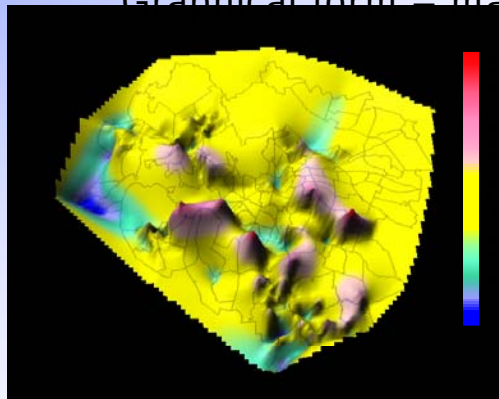


THE FORM OF THE RESIDUALS DEVELOPMENT FOR USES IN THE VALUATION OF REAL ESTATE

THE RESIDUALS

$$e_i = y_i - f(x_i, \beta_i)$$

Graphical form – maps



Numerical form – the geostatistical model

$$\hat{y} = a + \sum_{i=\text{pow,gleb,front}} a_i \log x_i + \sum_{j=UT} a_j x_j + \sum_{k=\text{data,G,T,DD,Ud,PZP}} (a_k x_k + b_k x_k^2) + \sum_{l=K,W,E} (a_l x_l + b_l x_l^2 + c_l x_l^3) + \sum_{m=\text{atrW,atrL,odlH,odlC,odlK}} (a_m x_m + b_m x_m^2 + c_m x_m^3 + d_m x_m^4)$$

Full

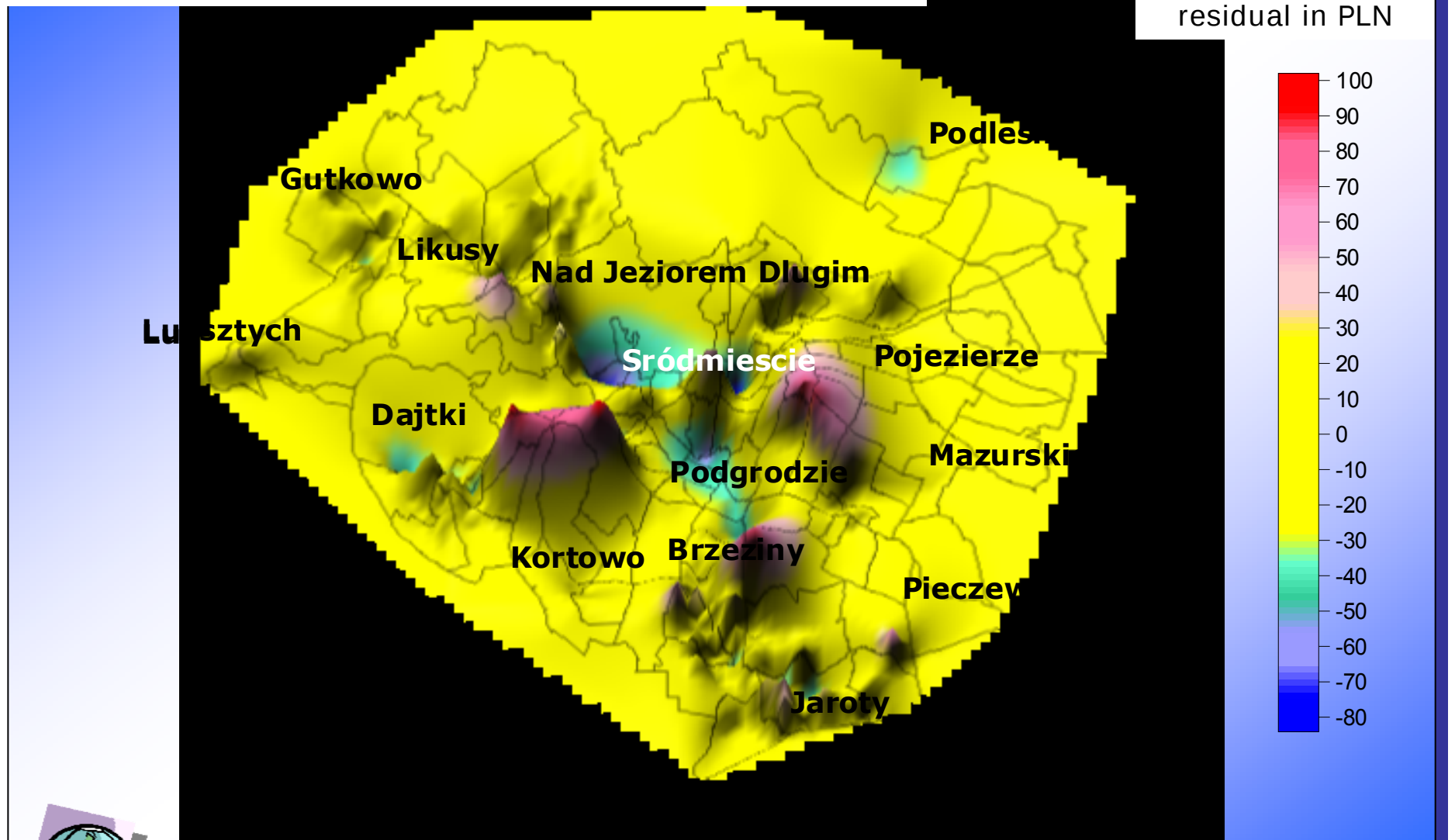
Partial

Full



„The possibility of the utilization of the residuals from the model in the interpretation of innovative spatial processes”

GRAPHICAL FORM – MAPS



Spatial model of the residual of undeveloped real estate in Olsztyn

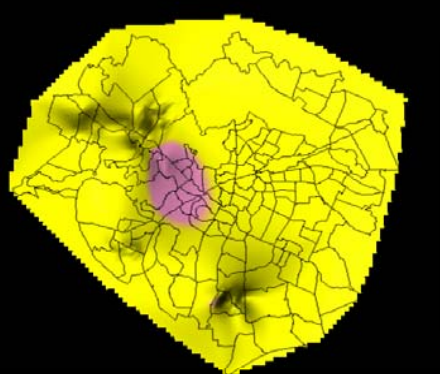


SPATIO-TEMPORAL CHANGES

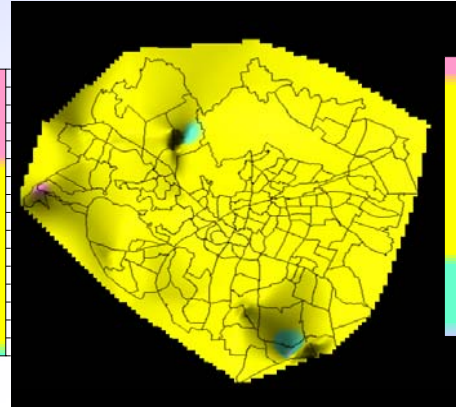
Analysis of the spatial distribution of residuals, after their division, we can trace and see occurrence and diffusions of the innovation and analysis of reasons spatio-temporal changes at a time.



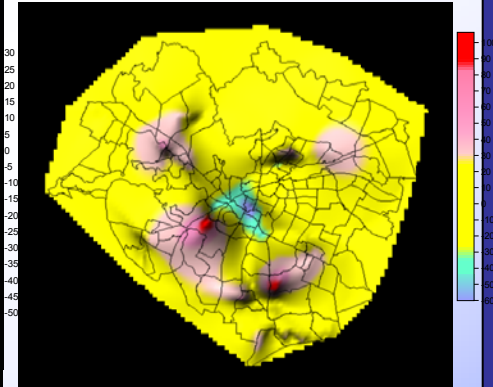
I rok-1997



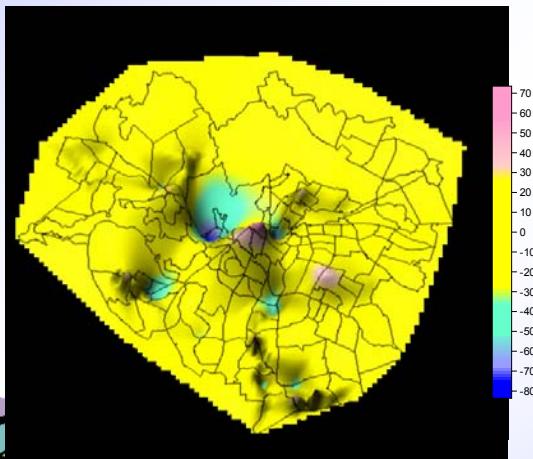
II rok-1998



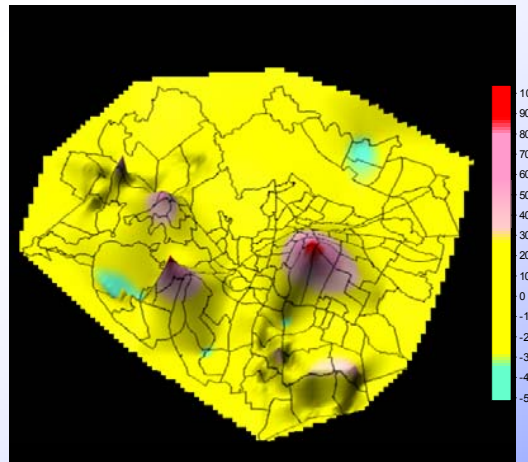
III rok-1999



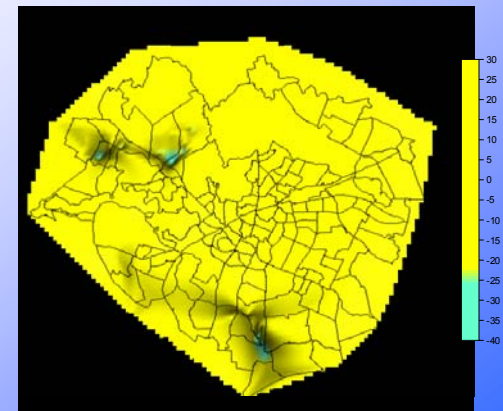
IV rok-2000



V rok-2001



VI rok-2002



VII rok-2003

Market space

(information about transactions on the market)

Innovations, perturbations,
disturbances of the market
system

P
R
O
B
L
E
M

Conception

**The geostatistical
model**

**The spatial
residuals**

Essential analysis
and knowledge

Issue

Deterministic inference
with stochastic
elements

Stochastic
inference

**Deterministic
value**

**The residual
value**

Planning and
urbanistic
solutions

Formal-legal
solutions in
REM and SM

Individual
counselling with
a great level of risk

Taxation
solutions

Individual
counselling with
an average level
of risk

Developmental-
strategic
solutions

Analyses of
optimization
and
profitability

**Speculative
(forecast)
value**

GIS program -SURFER

Surfer is a grid based Graphics program used for Mapping XYZ data into grids.

The gridding methods in Surfer allow you to produce accurate contour, surface, wireframe, vector, image, and shaded relief maps from your XYZ data.

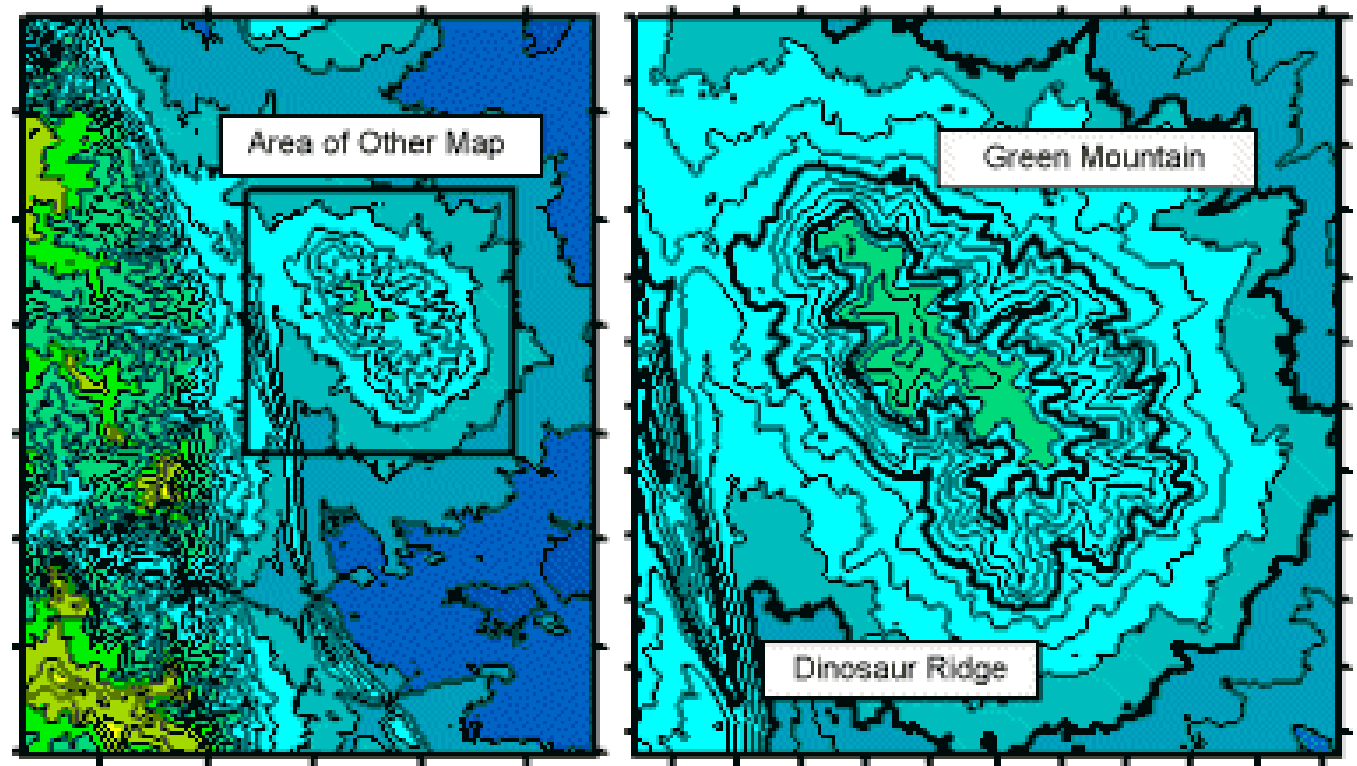
The data can be randomly dispersed over the map area, and Surfer's gridding will interpolate your data onto a grid. You have a multitude of gridding methods (*Inverse Distance, Kriging, Minimum Curvature, Polynomial Regression, Triangulation, Nearest Neighbor, Shepard's Method, Radial Basis Functions, Natural Neighbor, Moving Average, and Local Polynomial*) to choose from, so you can produce exactly the map you want.



GIS program -SURFER

These grids can be used to create many map types including Contour maps, Vector Maps, Wire frame maps, and surface maps.

Contour maps - two-dimensional representation of three-dimensional data



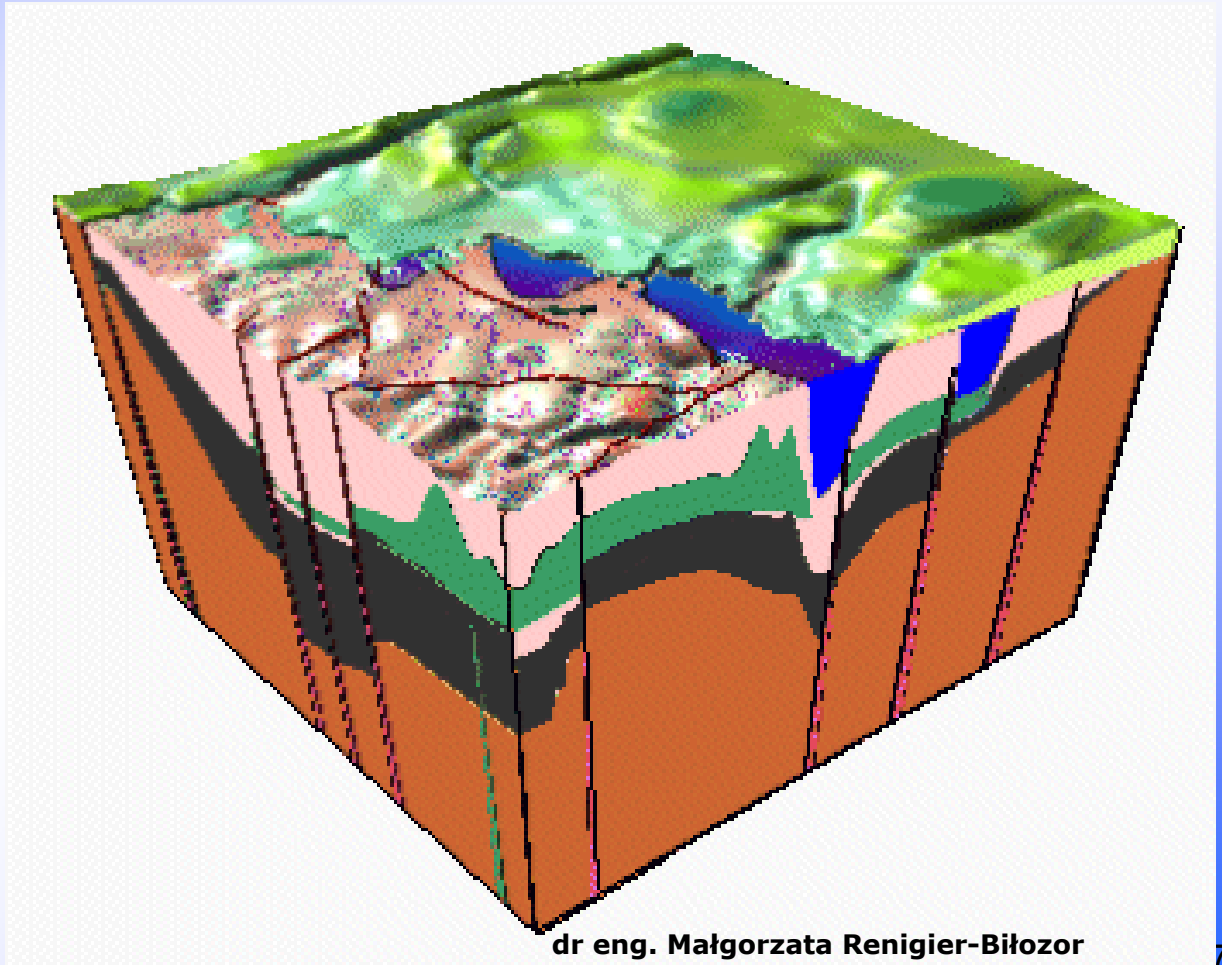
Morrison, Colorado
7.5' Quadrangle

Expanded View of Green Mountain
(from a portion of the Morrison Quadrangle)

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POLAND



Surface maps - enable the perfect visualization of three-dimensional data maps

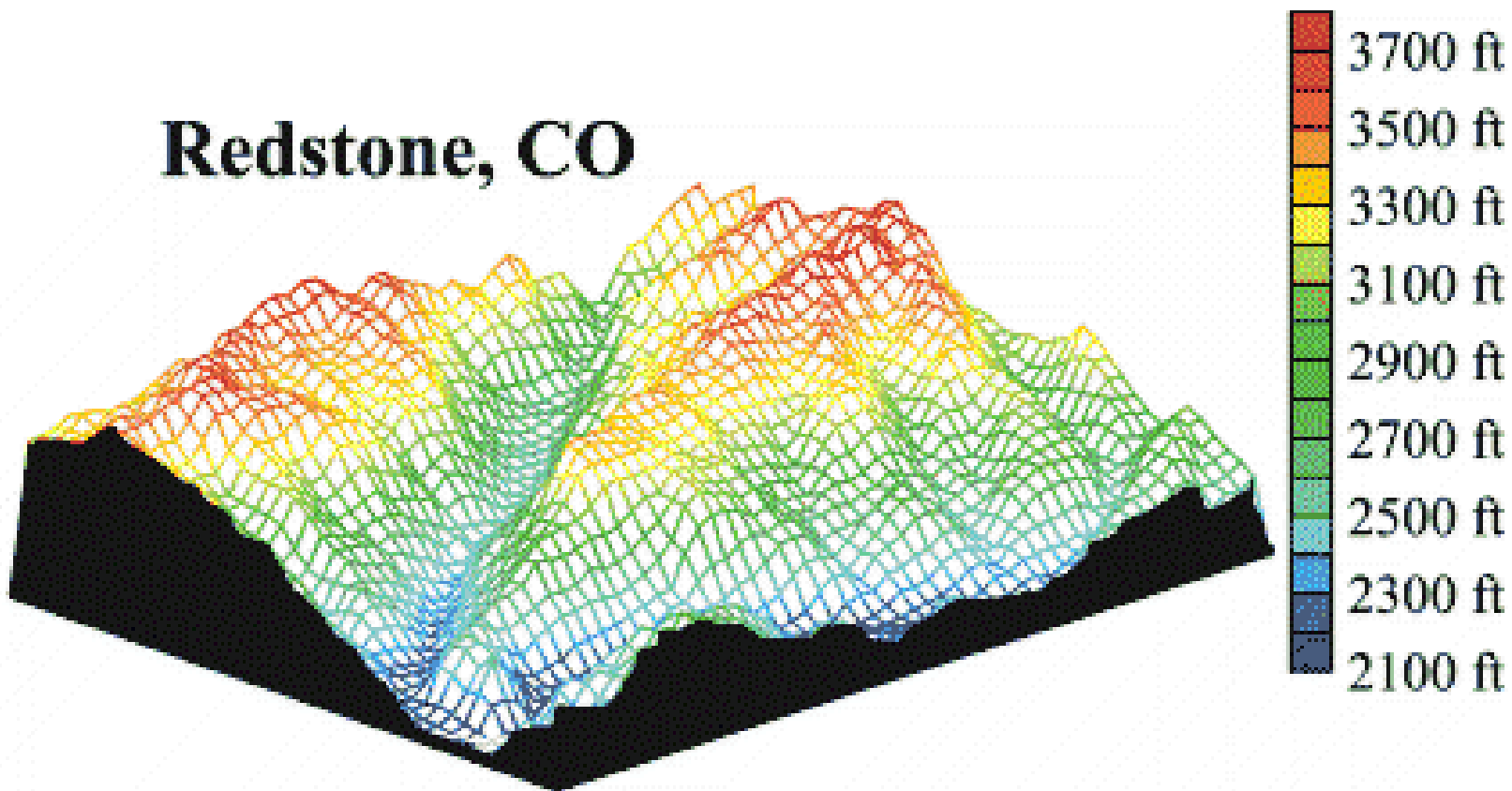


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Wireframe maps – these maps provide a three dimensional display of data and enable use color zones in independent X,Y,Z scaling.

Redstone, CO



GIS program -SURFER

Vector Maps - show direction and magnitude of data at points on a map.

