INTRODUCTION TO THE TRAINING CASES FOR DATA ANALYSIS

The training cases provided should be considered as an exercise to develop and improve skills in dynamic analysis.

Your treatment of the cases may be used as an input to the workshop as well, provided that it is submitted in a suitable paper by the deadline of 23 April. The paper should contain a proper description of the approach that has been applied and the analysis results including the uncertainty of all cases except Case 1. **Please clearly describe the process that you applied in choosing your analysis method and a suitable model, including intermediary steps and "wrong turnings".**

It is strongly advised to make use of the information given in the books handed out at the Conference, held at the JRC Ispra, 13-14 November.

- System Identification Competition, EUR 16359
- System Identification Applied to Building Performance Data, EUR 15885

For those who would like to receive a copy of these books (subject to availability), please contact hans.bloem@jrc.it.

The building physical definitions of the thermal characteristics are given in the Annex.

Short descriptions are given below for each case. Further details can be found in the respective case descriptions.

CASE 1.
Estimation of resistance (R) and capacitance (C) of a three-layer wall and estimation of the standard error of these estimates and the time of a sensor failure.

This case is intended for self training. The data provided is simulated data and for the second part of the case study, disrupted by different noise levels. Since the exact answer is known, one can play around with the identification tool and can study different models and methods (output error method, prediction error method, continuous time, etc.)

CASE 2.
Heatflow sensor test on three layers of Polipan. Estimation of R from real data.

The aim of the experiment was to recalibrate 'old' heatflow sensors after the arrival of new heatflow sensors, recently calibrated by the manufacturer. It was also intended to create data series for analysis training. A pulse of heat was applied to one side of a three-layer slab of insulation whilst temperatures and heat flows were measured at three interfaces. The data provided for the exercise come from a selected case that is stable and should not give too may problems to assess the result.

CASE 3.
Experimental data from a well controlled *in-situ* measurement.

The test wall consisted of three layers: 150 mm gas-concrete blocks insulated on both sides with a 27 mm glass-fibre board layer. The wall faced south-west. The external climate was natural, however during the first half of the measuring period, the wall was protected against solar radiation.

The aim of this exercise is to estimate the heatloss coefficient and its error for the 3 layer test wall for both datasets provided. The whole data series has been split into two periods; during the first period a shading device was applied to avoid the exposure of the exterior of the wall to solar radiation, whilst during the second period the effect of solar radiation on the wall, and therefore on the temperature readings, can be observed.

The report describes the experimental set-up and additional observations to provide you with sufficient information about the test.

CASE 4.

For a description of this case read the Case4.pdf file. The data can be find in the ‘veks.csv’ data file and a description of the variables in the ‘veks.exp.variables’ file which is a text file.

ANNEX: BUILDING-PHYSICAL DEFINITIONS

R is the thermal resistance (surface-to-surface) defined as the difference between the two surface temperatures in steady state divided by the density of heat flow rate [Km^2/W].

C_i is the internal thermal capacity per unit area of the wall defined as the amount of heat that goes into the wall per m2 as the result of a change from one steady state situation to another by increasing the internal surface temperature with 1°C [Wh/Km^2].

C_e is the external thermal capacity per unit area of the wall defined as the amount of heat which goes into the wall per m2 as the result of a change from one steady state situation to another by increasing the external surface temperature with 1°C [Wh/Km2].

C is the thermal capacity per unit area of the wall defined as the sum
$C_i + C_e$ [Wh/Km^2].

Heat loss coefficient (U-value) is the density of the heat flow rate divided by the difference between the internal (room) and external air temperatures [W/m^2K].