A National Study of Attitudes to Aircraft Noise

Presentation to Transport Practitioners Meeting

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Time constraints

- A considerable amount of data was collected in the Phase 1 pilot studies and the subsequent Phase 2 main study.
- In a 30 minute presentation we can only present 'edited highlights'
- Interested parties are strongly encouraged to download the full reports and peer reviews etc. from the DfT website.

- http://www.dft.gov.uk/pgr/aviation/environmentalissues/Anase/

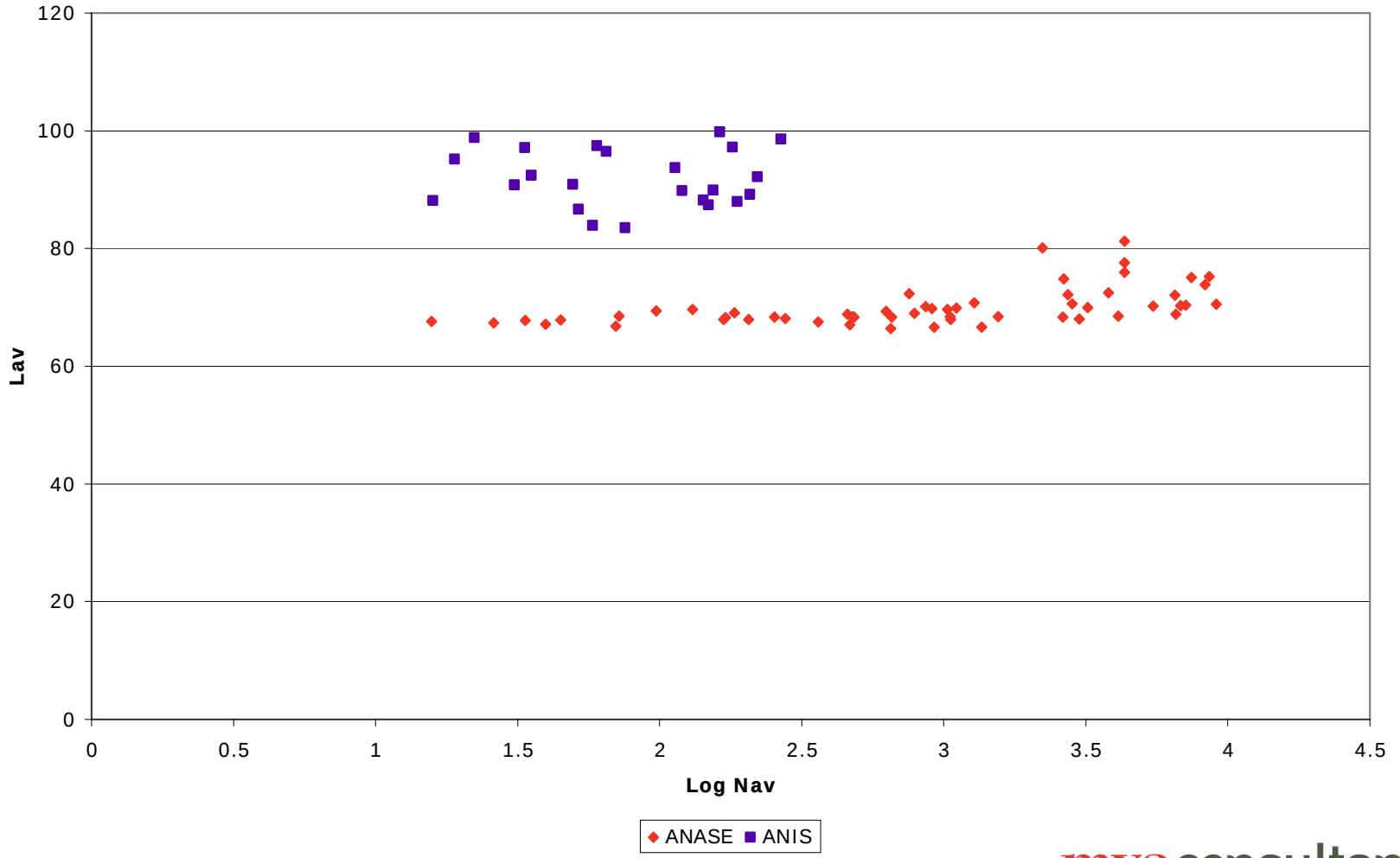
Background

- Aircraft noise assessment depends on reliable information about community response.
- The last major study in the UK was **ANIS** (aircraft noise index study) carried out in 1982 and reported in 1985.
- In 1990, based on ANIS results and other considerations, the UK government changed from the **NNI** (noise and number index) to **Leq** for measuring long term average aircraft noise sound levels around airports.
- In 1990, the **57 Leq contour** was defined as the '***onset of annoyance***', superceding the broadly equivalent **35 NNI contour** as the previous indicator of '***low annoyance***'.
- The 35 NNI contour was based on previous research going back to 1961

Changes since 1982

- Quieter aircraft - with much increased rate of climb for modern twin-jets.
- Significant increase in numbers of events.
- Attitudes to aircraft noise may have changed as people have in general become richer and many people now have increasing expectations, etc.
- Increasing technical debate about the validity of LAeq for representing average sound levels of intermittent events such as aircraft noise.

Average sound level (Lav) and log number of events (Nav) for ANIS (1982) and ANIS (1985)



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ANASE objectives

- Re-assess attitudes to aircraft noise in England.
- Re-assess their correlation with the **Leq** noise index.
- Examine (hypothetical) willingness to pay in respect of nuisance from such noise, in relation to other elements, on the basis of ***stated preference*** evidence.

- Further objectives agreed during detailed study design
- Fully random sampling across all large English civil airports to ensure statistical representativeness.
- Questionnaires conforming to current industry best practice.
- Noise modelling fully compliant with ECAC.CEAC Doc 29.

ANASE timescales

- Extensive pilot studies carried out from 2001 to 2004.
- The main study design benefited from an expert steering group and international peer review.
- Main study fieldwork 2005-2006.
- Publication on DfT web-site October 2007 after further extensive review.

ANASE sampling

- 20 Airports included in scope for study
- All Census Output Areas > 65 LAmax included in sample ~ 3,000,000 people
- Areas identified in terms of average event sound level Lav and average number of movements Nav
- Further stratification: Heathrow and non-Heathrow
- Random sampling within each cell of the stratification plan

Sound levels measurement

- INM v6.2 models developed for each airport
- Event sound levels calibrated against field measurements at 19 sites
- Numbers of events determined from air traffic data provided by airports
- Adjusted to reflect long-term modal splits at each airport
- 65 LAmax used as cut-off for main analyses
- Models estimated values of **SEL**, **LAmax**, **Lav**, **Nav** and **Leq**

ANASE interviews

- 60 full[1] interviews at 36 sites
- 15 restricted[1] interviews at 40 sites (20 low noise, 20 irregular[2] air traffic)
- 2,733 interviews completed at 76 sites
- For the Stated Preference questions the full interviews required audio-visual demonstration of aircraft types included in the scenarios tested
- Individual responses weighted to remove sample bias:
  - People per household
  - Age (using Census data)

1 Full interviews include stated preference questions, restricted interviews exclude stated preference questions

2 Leq not calculated for irregular air traffic

ISO annoyance

ISO/TS 15666 specifies standardised annoyance questions – to be placed as early as possible in the questionnaire

> *"Thinking about the last 12 months or so, when you were at home, how much does noise from aircraft bother disturb or annoy you: Not at all, Slightly, Moderately, Very, Extremely?"*

The ISO 11 point numeric annoyance scale was also included – the data was highly correlated with the 5 point semantic scale.

All further analysis based on the 5 point semantic scale

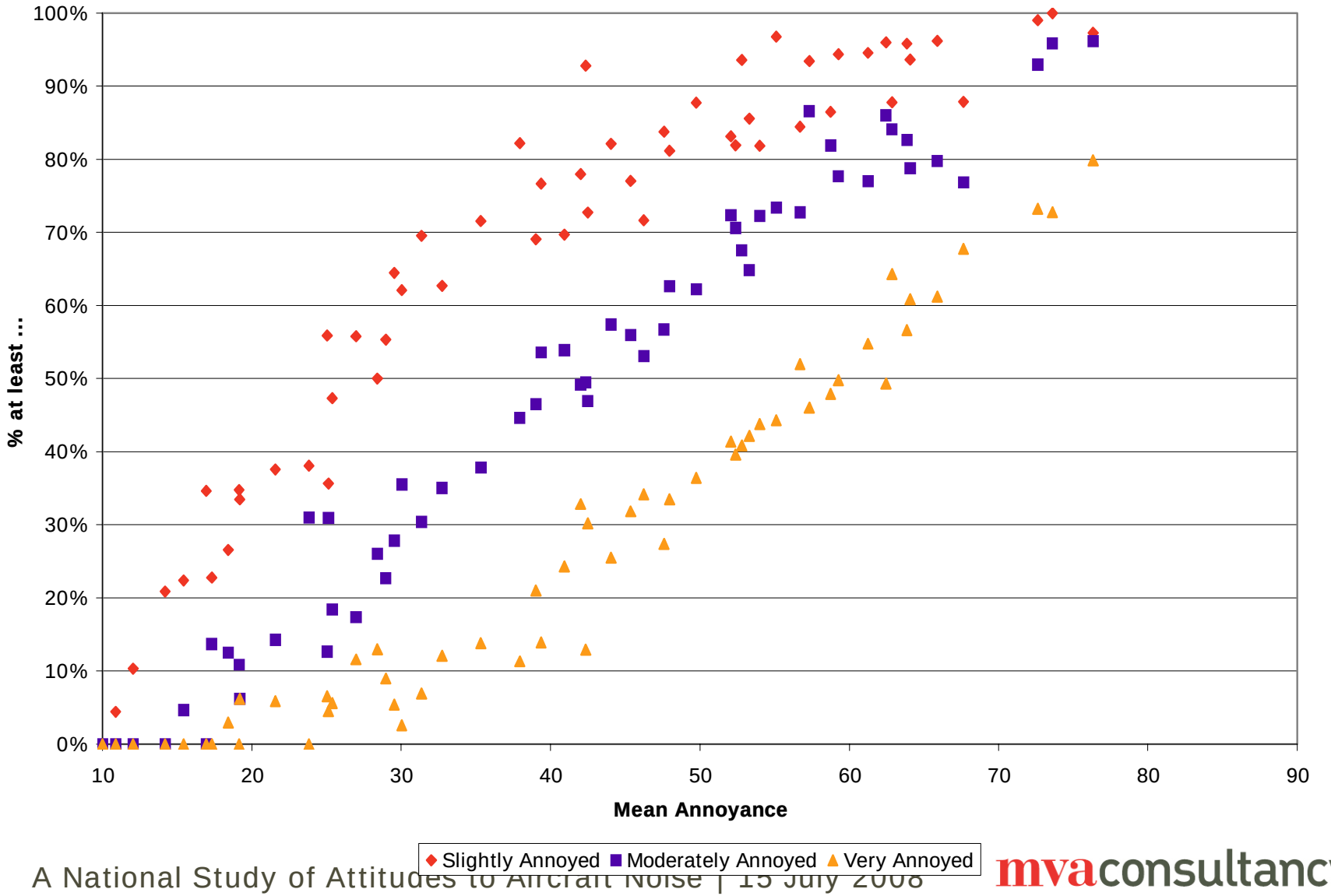
ANIS annoyance scale

ANIS scale		ISO scale	
Very much annoyed	87.5	Extremely annoyed	90
Moderately annoyed	62.5	Very annoyed	70
A little annoyed	37.5	Moderately annoyed	50
Not at all annoyed	12.5	Slightly annoyed	30
Not heard	12.5	Not at all annoyed	10

Numeric transforms used to facilitate statistical analysis and comparison

Meidema and Oudshorn method used to transform semantic scale points to numeric equivalents

ANASE results



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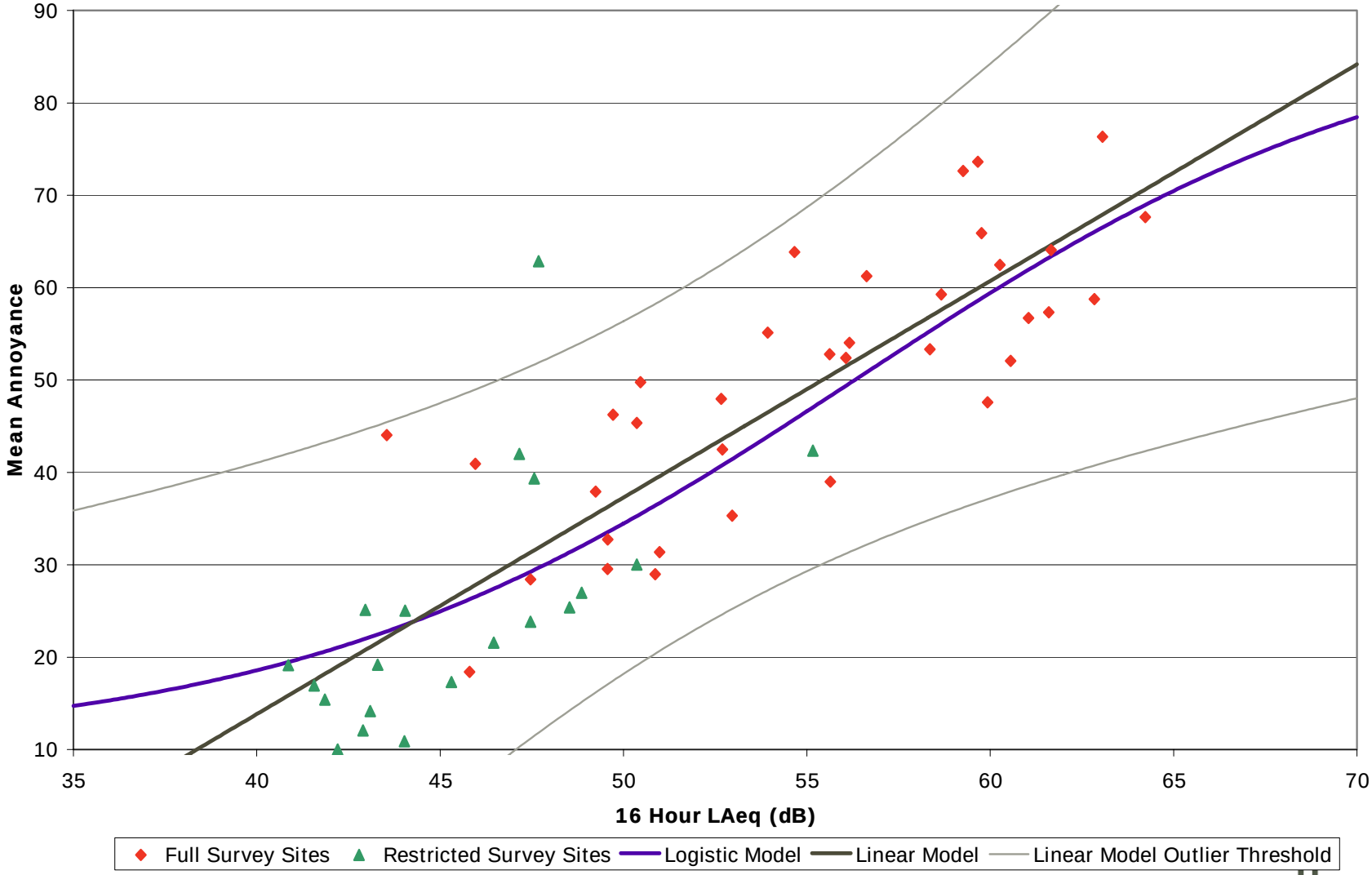
ANASE exposure-response relationships



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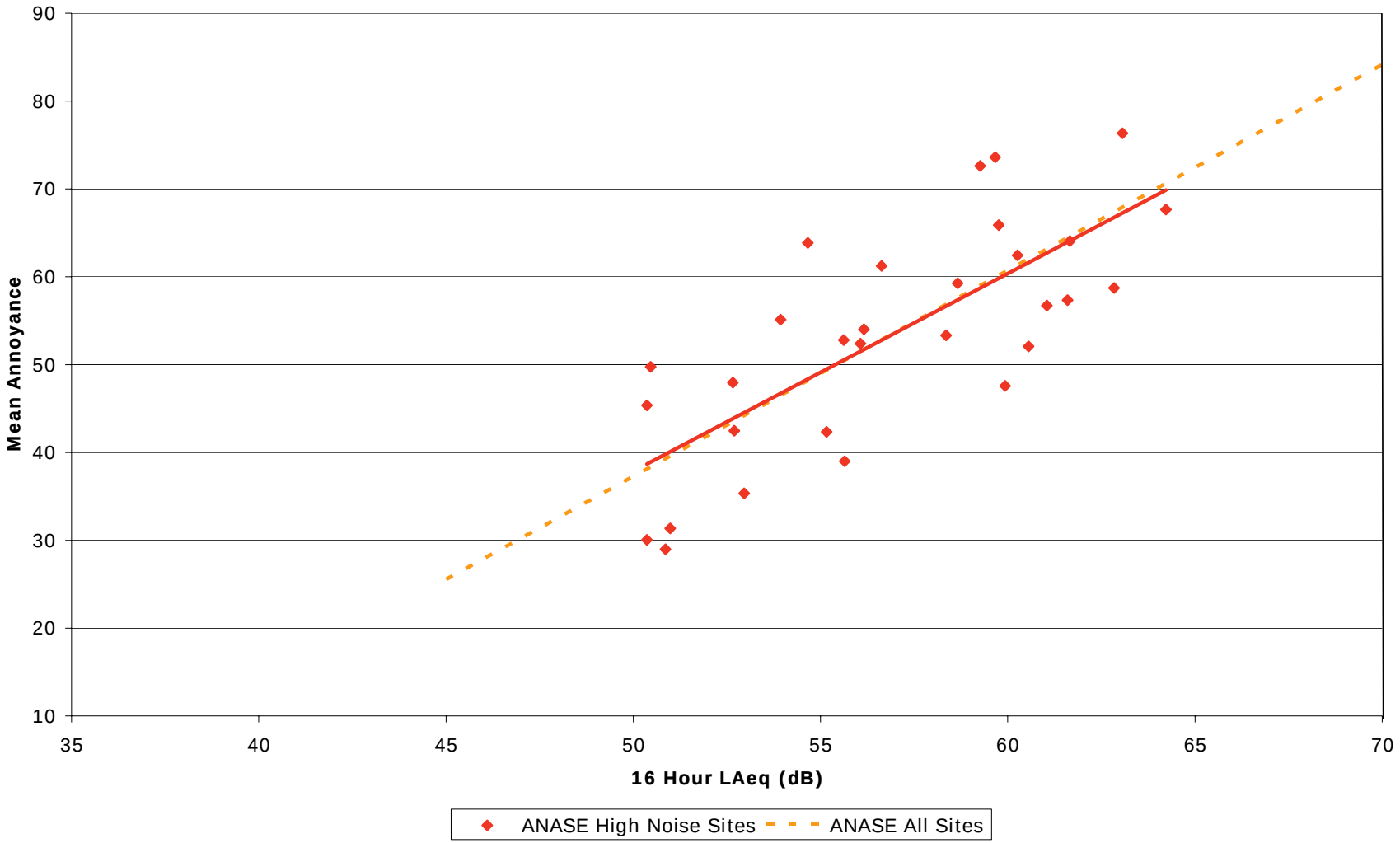
ANASE higher noise sites



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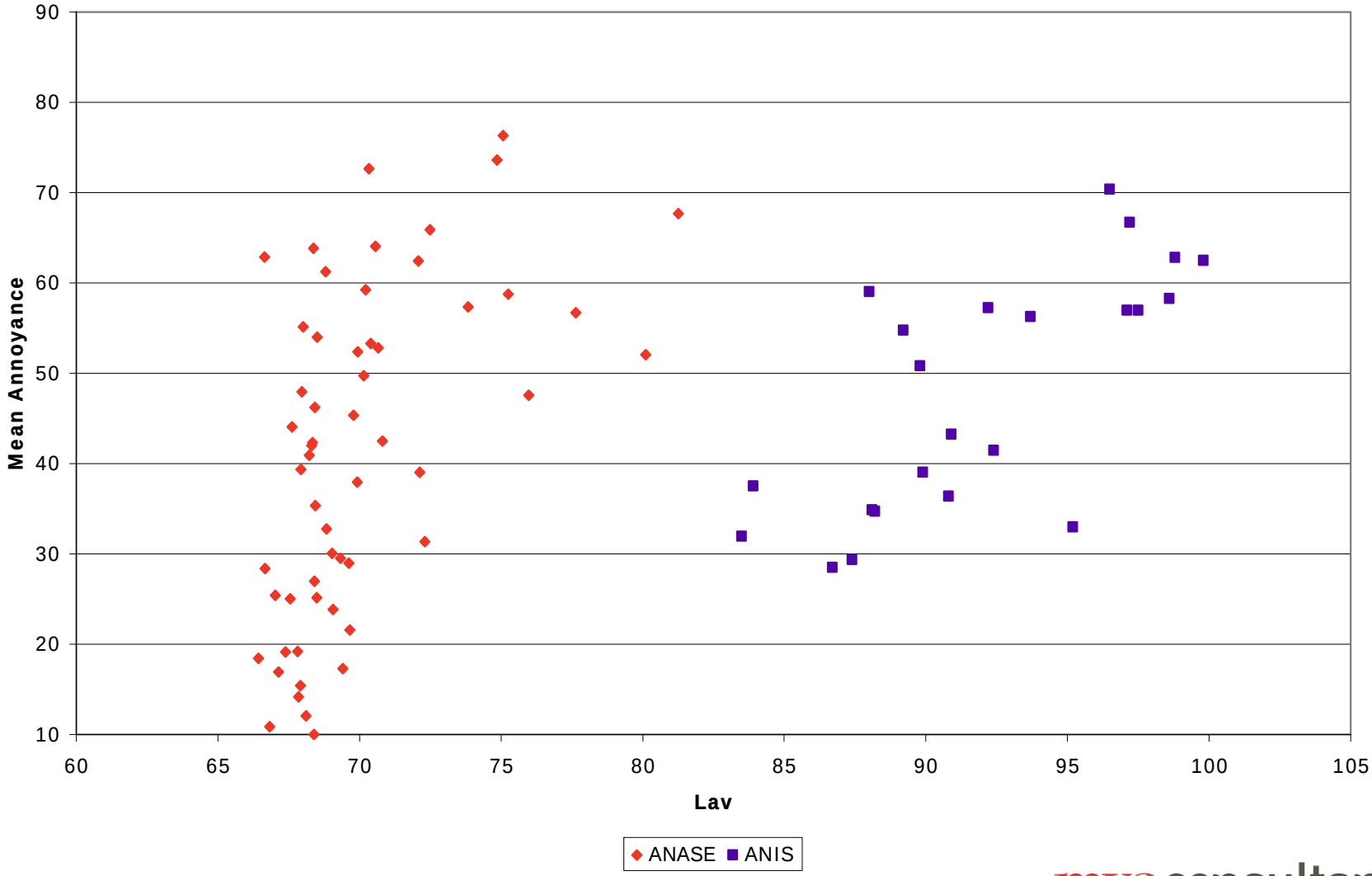
Re-assess attitudes to aircraft noise in England

- Linear and logistic models fit annoyance data equally well
- Logistic preferred on grounds that it respects the bounds of annoyance in the data
- For practical purposes, analysis of the effects of further site variables done using linear models
- A wide range of socio-economic variables tested
- The best fit model has LAeq and mean income as the explanatory variables
- No threshold could be identified in the relationship between mean annoyance and LAeq (ie no value of LAeq at which mean annoyance showed a step increase)

ANASE against ANIS - sound level



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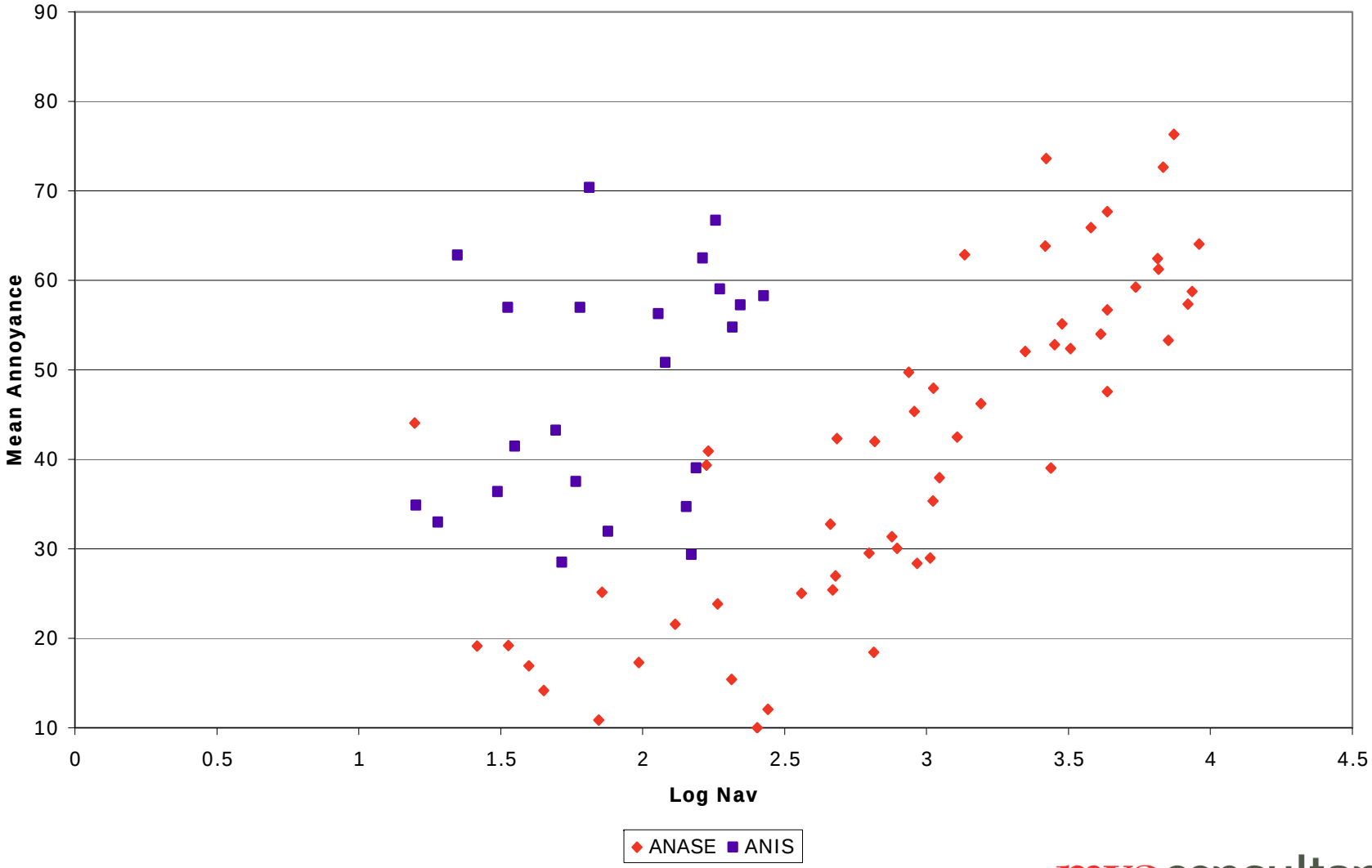
ANASE against ANIS – number of events



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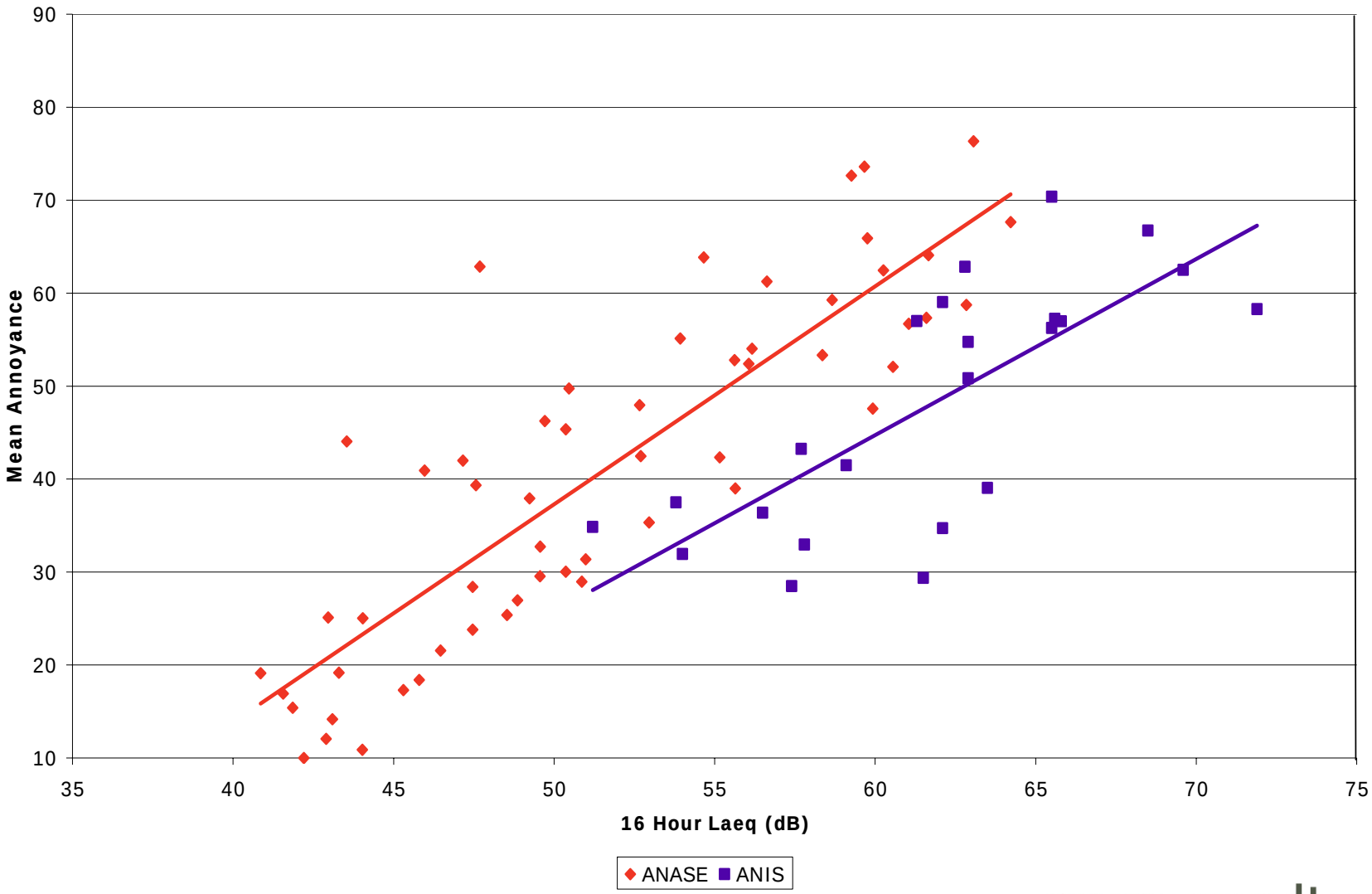
ANASE against ANIS - LAeq



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Re-assess their correlation with Leq

- Explore relationship between mean annoyance, average sound level (Lav) and number of events (log Nav)

- ANIS:

  A = -158.3 + 1.99 Lav + 12.5 log Nav

  'k' ratio log Nav/Lav ~ 6

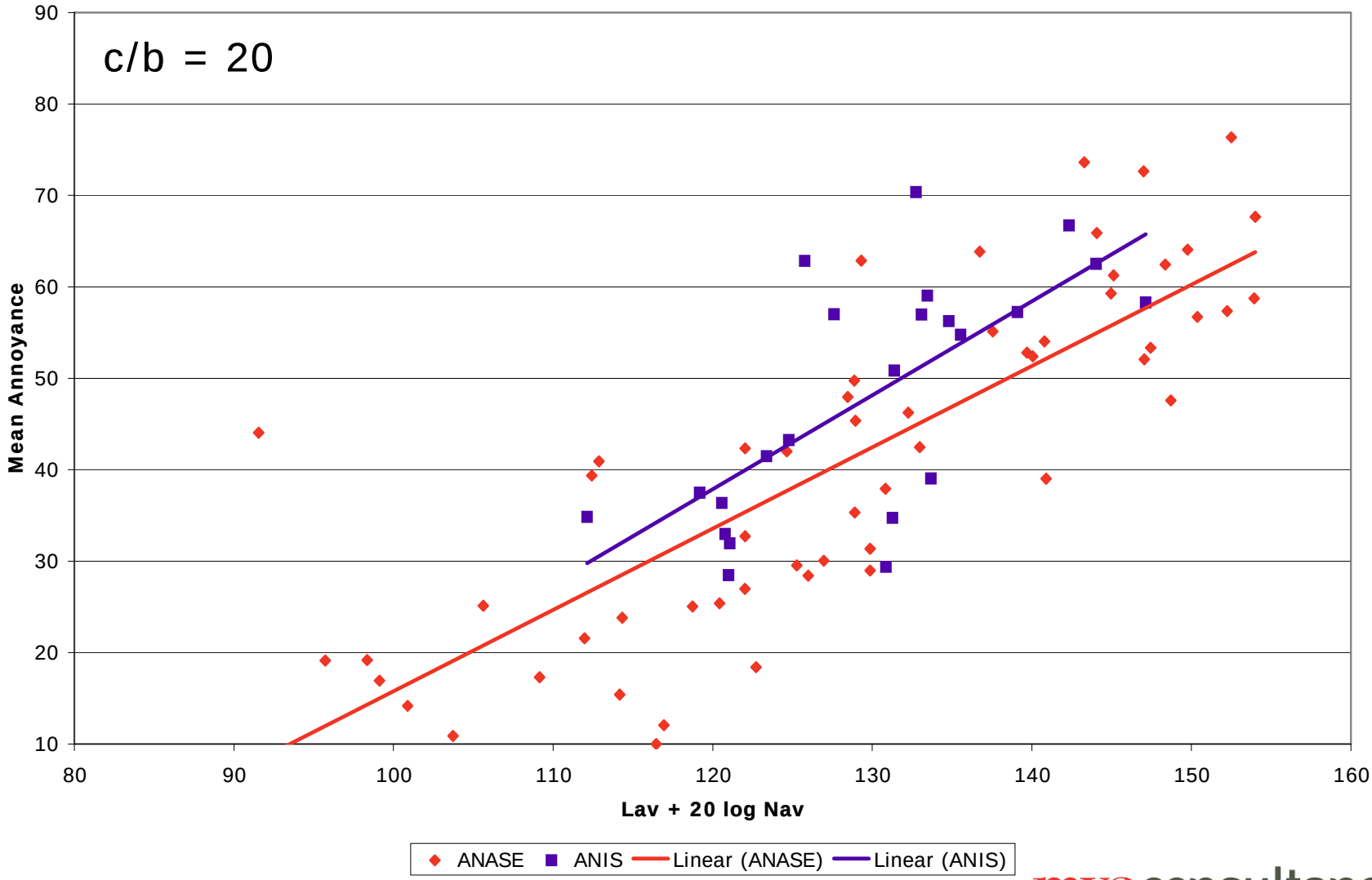
- ANASE:

  A = -71.6 + 0.86 Lav + 17.9 log Nav

  'k' ratio log Nav/Lav = 21

- 'k' ratio between noise and number unstable over time

Comparing ANASE and ANIS data



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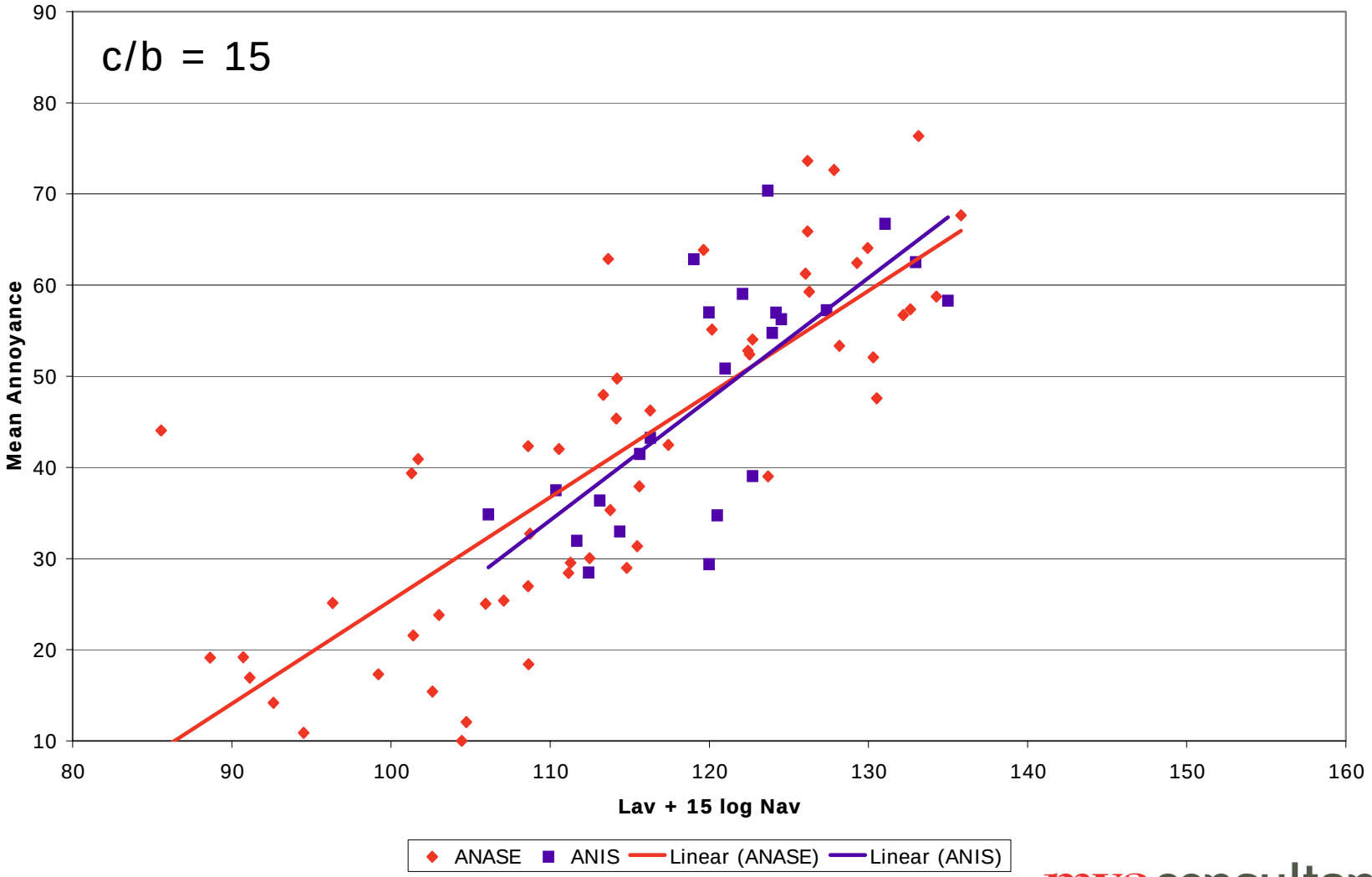
Comparing ANASE and ANIS data



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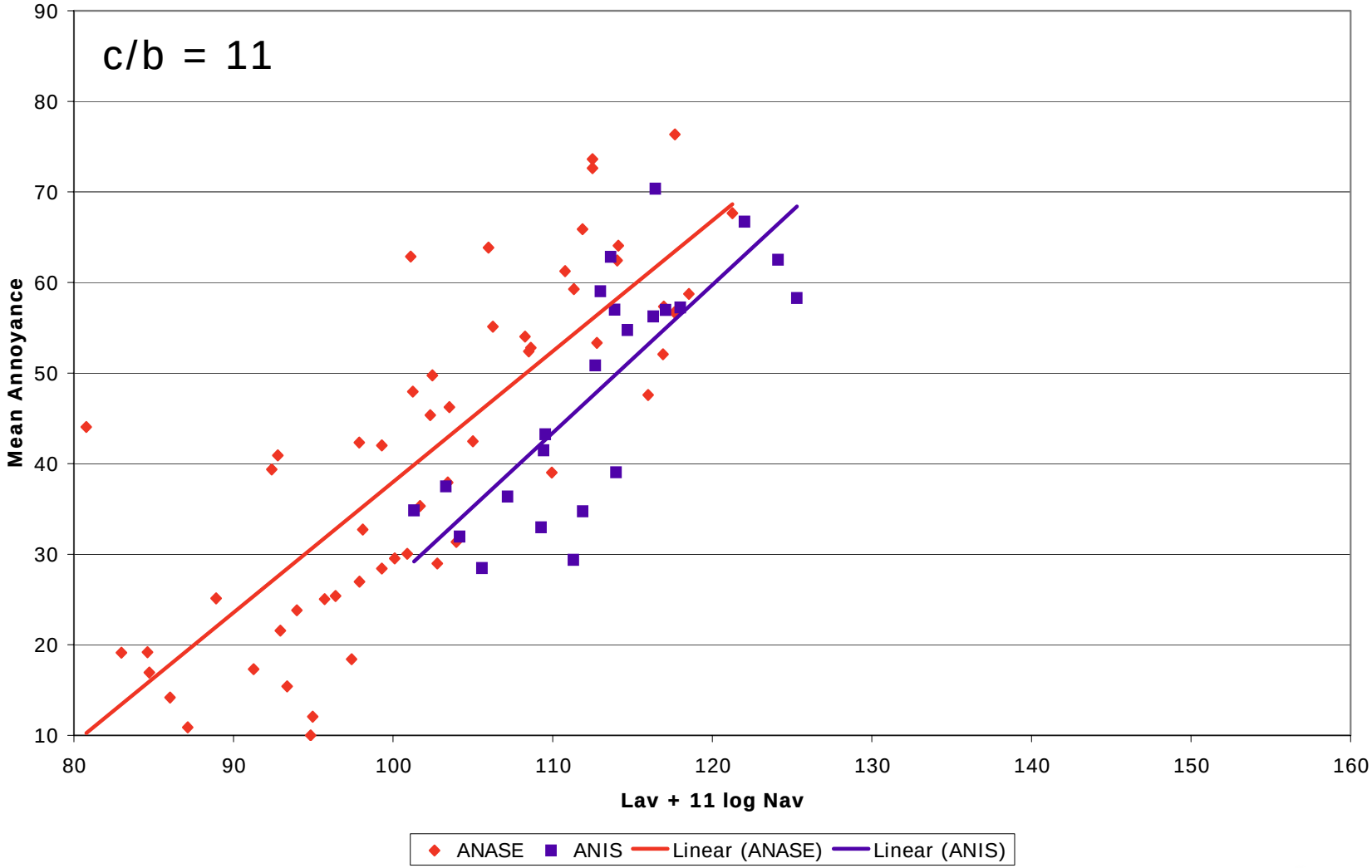
Comparing ANASE and ANIS data



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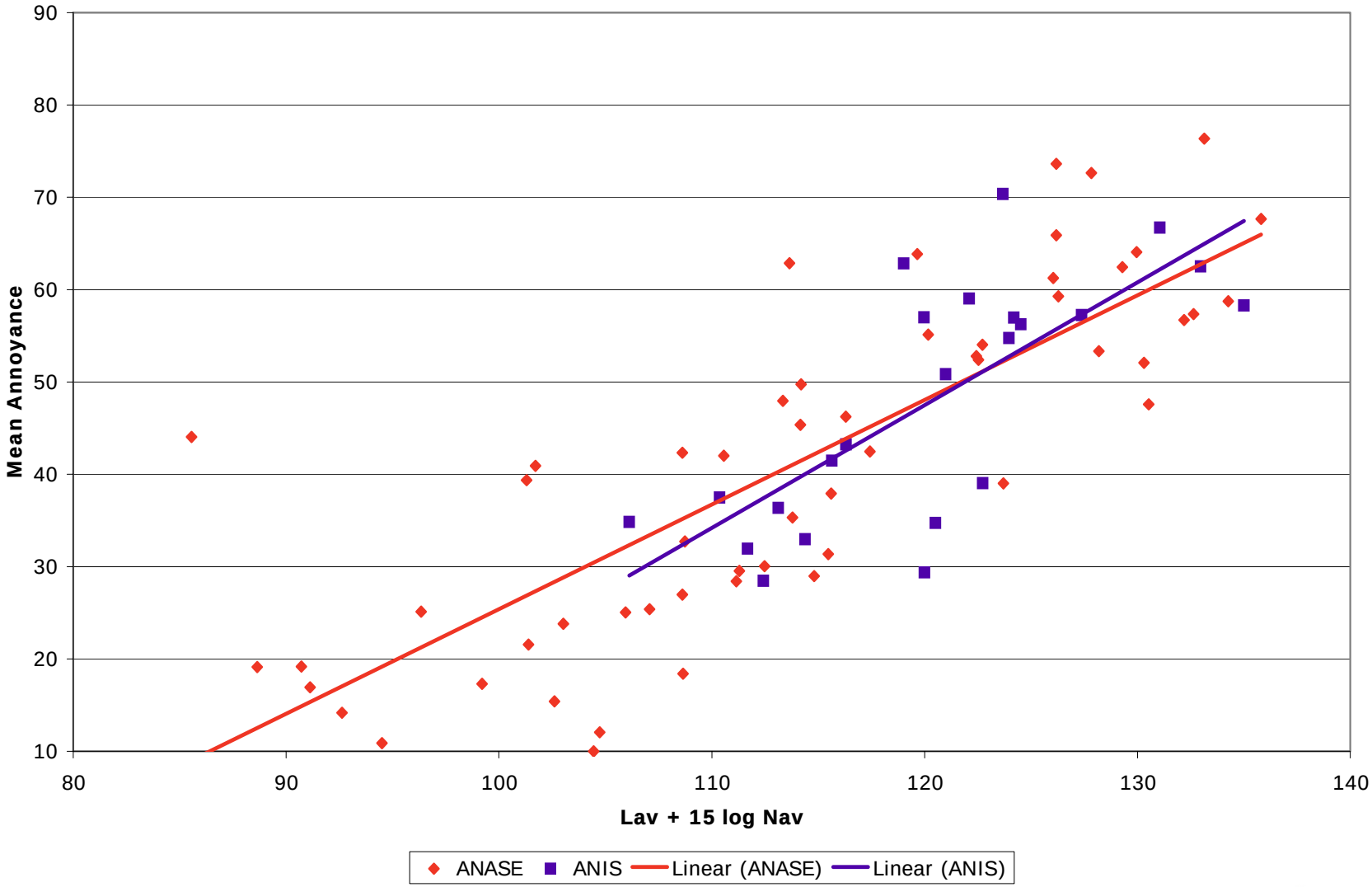
Consistent annoyance over time at k=15



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Conclusions

- Reported annoyance has a strong relationship with LAeq
- People report higher levels of annoyance in 2005 (ANASE) than in 1982 (ANIS) for a given LAeq
- But LAeq is NOT the best proxy for reported annoyance *as* the rel. effect of Noise & Number has changed over time
- The best-fit model for ANIS (1982) has a weight of 6 on log Nav cf 21 for ANASE (2005)
- Under today's conditions a weighting of 15 or more provides a better reflection of current opinion (see NNI)
- Using a weight of 15 (as was used pre-ANIS) would indicate that attitudes to aircraft noise have NOT changed

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