

FULL-SCALE FIELD EXPERIMENTS
WIND & STRUCTURES



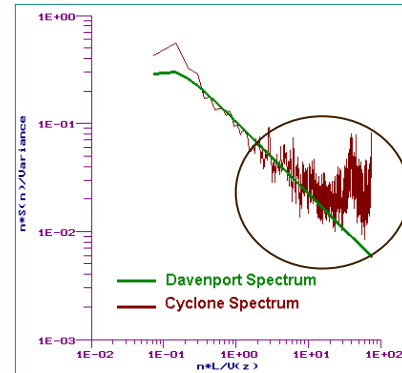
ASSESSMENT OF WIND LOADS ON STEEL LATTICE TOWER UNDER EXTREME WIND CONDITIONS

• Cyclone wind characteristics – a new design requirement

- Mean wind speed profile
- Intensity of turbulence
- Turbulence Spectrum
- Implications
 - Dynamic wind loads
 - Rigid structures



52m tall lattice tower



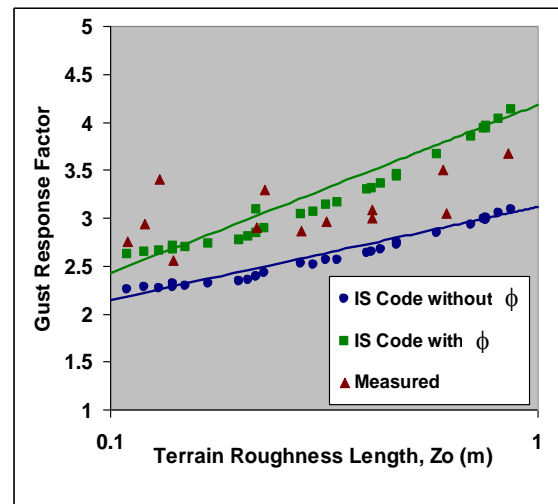
• Gust response factor for design of lattice towers

- Effect of second order effects

$$(\bar{U} + u')^2 = \bar{U}^2 + 2\bar{U}u' + u'^2 \rightarrow \phi$$

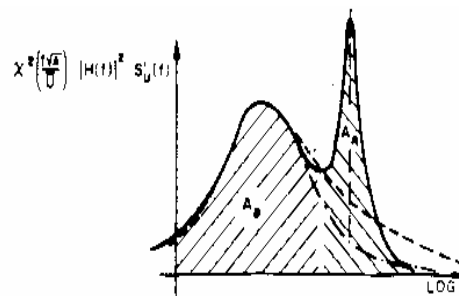
- Gust Response Factor (GRF)

$$G = 1 + gfr \sqrt{B(1+\phi)^2 + \left(\frac{SE}{\beta}\right)}$$

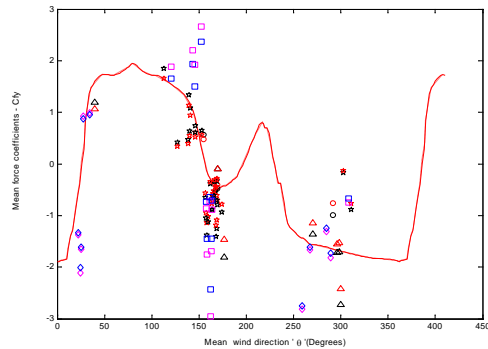
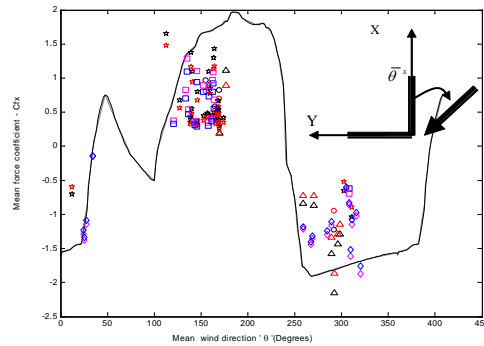
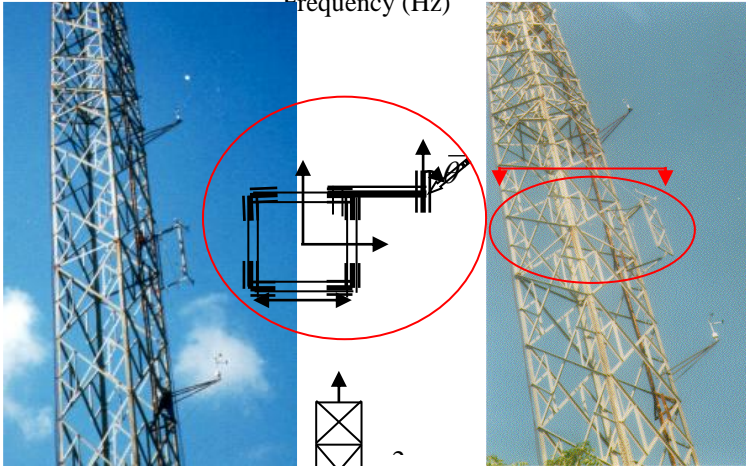
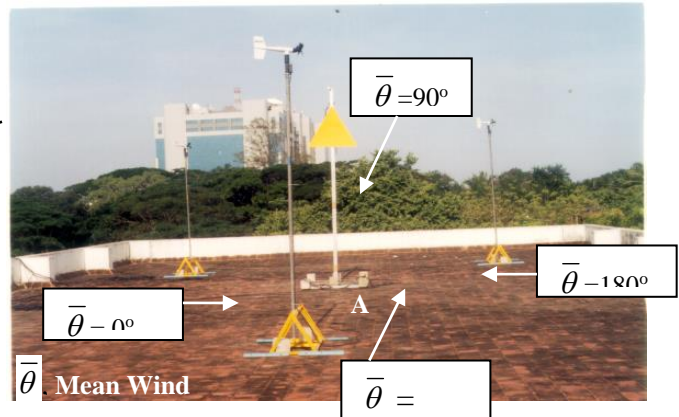
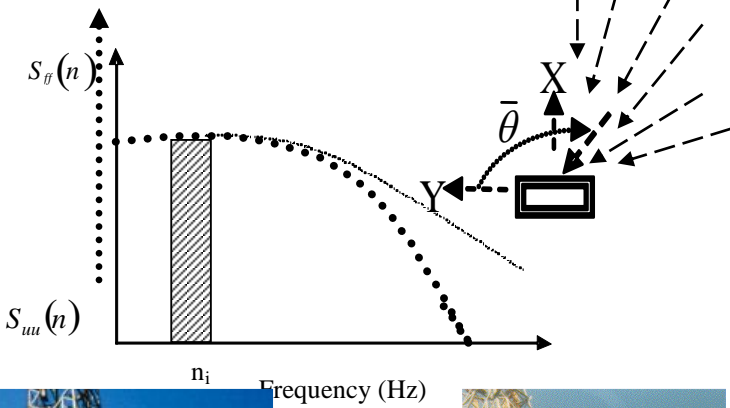


➤ Recommendations

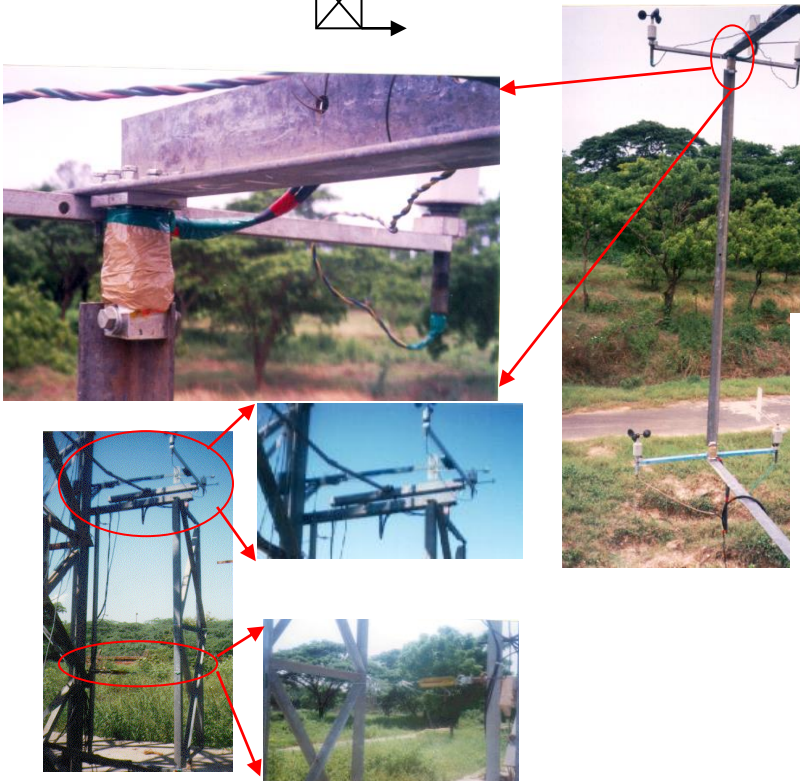
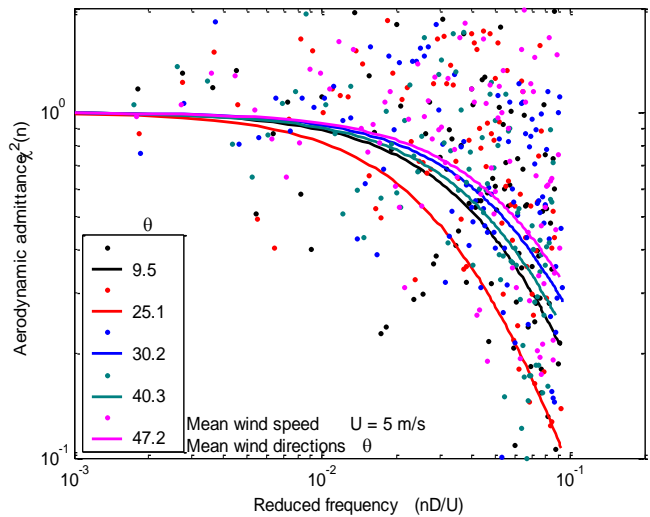
- Cyclone turbulence spectrum
- Higher TC for turbulence intensity
- Second order effects
- Wind loads on antennae



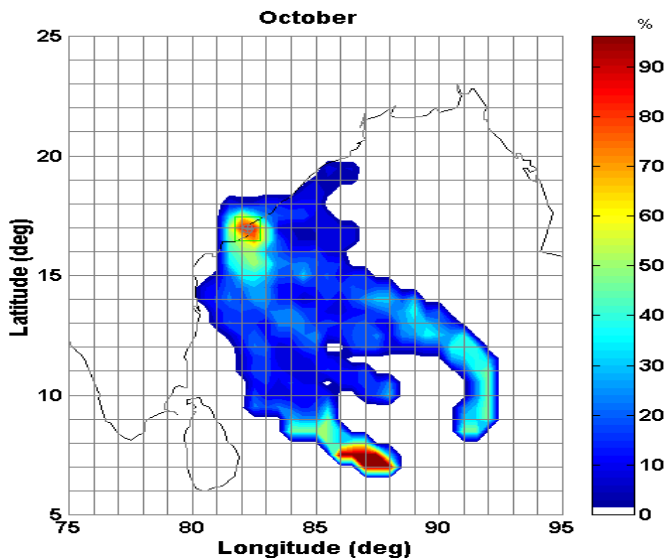
DYNAMIC LOADS AND RESPONSE OF STRUCTURES UNDER NATURAL WIND



○ L55@ 3m ☆ L75@ 3m △ L90@ 3m □ L100@ 3m ◇ L100@ 23m



CONTRIBUTIONS TO CYCLONE DAMAGE MITIGATION

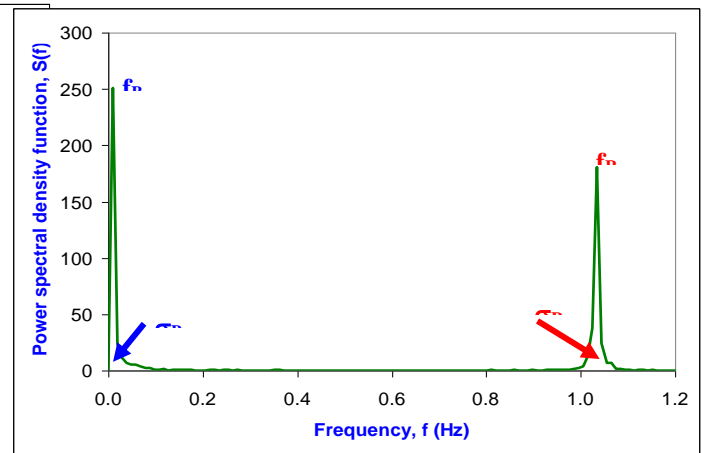
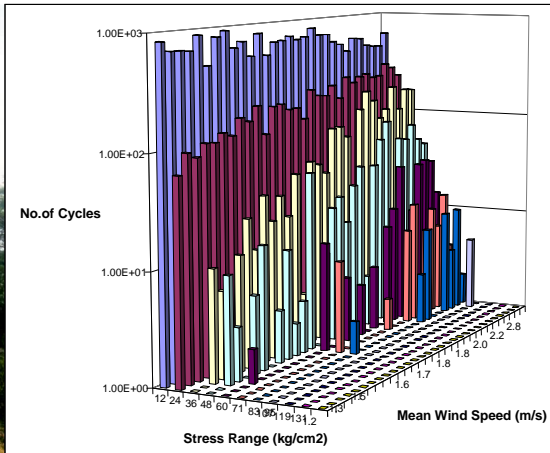


FULL-SCALE MEASUREMENT OF PRESSURES ON A LOW-RISE SPACE GRID ROOF

- Wind and pressure data
- Statistical and spectral analyses
- Peak pressure coefficients

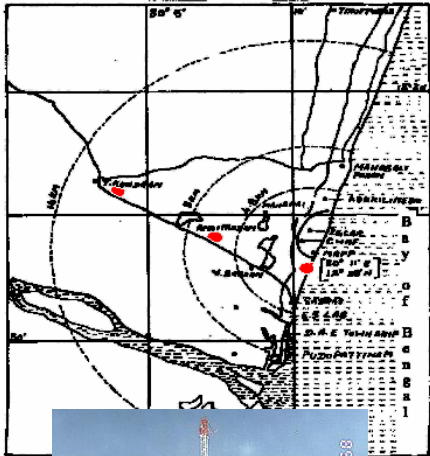


IN-SERVICE WIND INDUCED FATIGUE EVALUATION



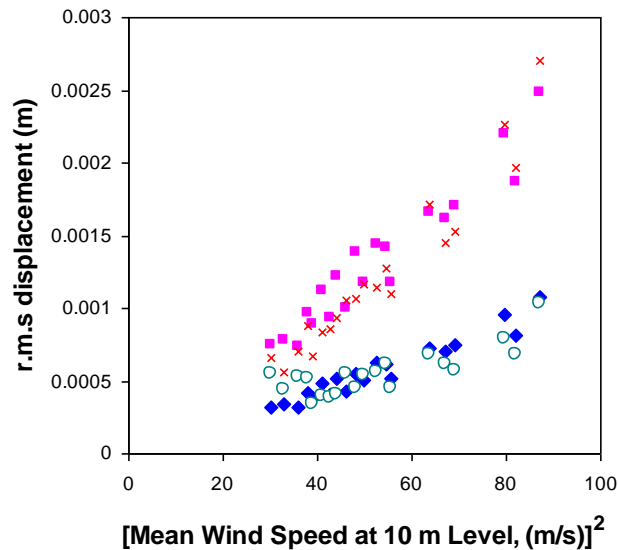
**AN INNOVATIVE BIMODAL FATIGUE LOAD SPECTRUM
BASED ON RAINFLOW COUNTING OF STRESS CYCLES**

INVESTIGATIONS ON DYNAMIC RESPONSE OF A 50M TALL GUYED MAST UNDER WIND LOADING (GAP)



- Non-linear behaviour of mast and guys
- Design of guyed mast
- Field measurement of dynamic response
- Comparison of dynamic response of guyed mast

50m tall guyed masts

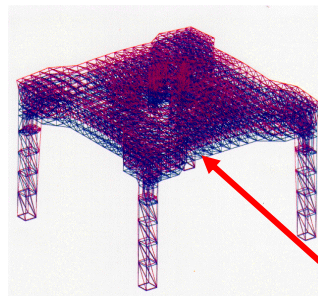


- ◆ at 29 m (Davenport for X&Y)
- at 50 m (Davenport for X&Y)
- at 29 m (Measured Max. of X&Y)
- × at 50 m (Measured Max. of X&Y)

TRANSIENT DYNAMIC ANALYSIS OF MOBILE LAUNCH PAD

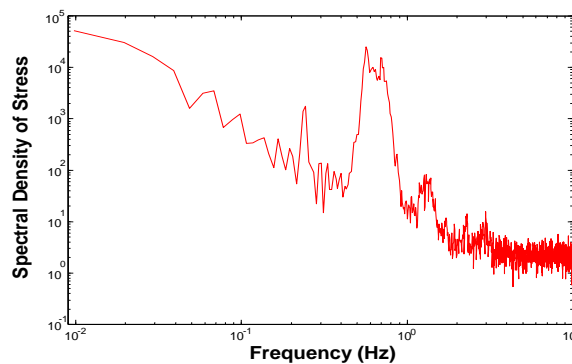
HEAVILY STIFENED STEEL STRUCTURE
STATIC AND DYNAMIC DESIGN FOR

- SELF WEIGHT
- WIND LOADS
- PROPULSION LOADS
- ACOUSTIC PRESSURE LOADS
- DIFFERENTIAL SOLAR HEATING
- THERMAL LOADS
- JET PRESSURE LOADS



ANALYSIS, DESIGN, AND FIELD TESTING OF TOWER SUPPORTING WIND TURBINES

- Dynamic response measurement under operating conditions
- Statistical, spectral and cycle counting analyses
- Fatigue damage evaluation



➤ PUBLICATIONS

Papers

International Journals
National Journals
International Conferences
National Conferences
Technical Reports

Number

: 5 +1 (4 under review)
: 1
: 4
: 12
: 25

Life member of **5 Professional societies** and
member of **3 BIS committees**

➤ SERVICE TO INDUSTRY

○ **Consultancy projects** : **35**

(M/s SUZLON, IGCAR, VICTORY,
POWERGRID, MECON, SANGEETH.....)



➤ HONOURS AND AWARDS

- **Certificate of Appreciation –Engineering Technology Prize, CSIR 1999 (Engg.software Development)**
- **Certificate of Appreciation – CSIR Shield for Engineering Technology, (Wind Engineering), 2000**
- **A.S. Arya-UOR Disaster Prevention Award, University of Roorkee, 2000(Cyclone disaster)**
- **Dr. Jai Krishna Medal – IE (India), 2001**
- **Certificate of merit – Dr.Ramaiah Prize , 2003**
- **Certificate of best technical paper- Dr.Ramaiah Prize, 2004**
- **ISWE best paper award – 2004**
- **Ph.D degree at IIT, Madras , July 2005 (work done 1997-2004)**

▪ FUTURE PLAN OF WORK

- **Field Measurement of loads and responses of lattice and tubular structures**
- **Development of low cost wind turbine 500kw support tower**