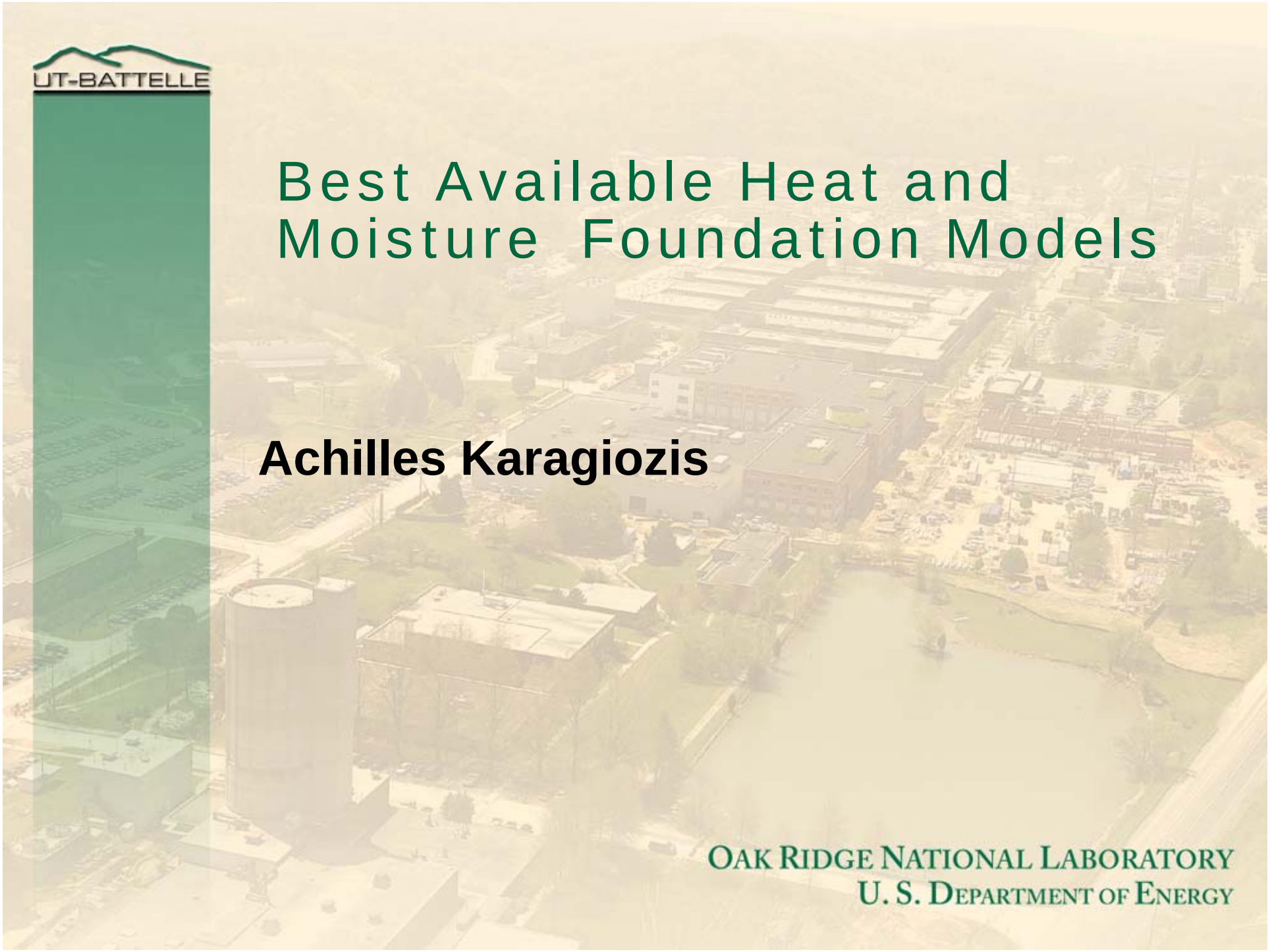

Best Available Heat and Moisture Foundation Models

Achilles Karagiozis

OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

Progression/State-of-Art

- **A lot of tidbits (Tim Horton's style) Experimental, Laboratory (??), Modeling**
- **Some very nice NEW experimental data available**
- **Europeans + Canadians have stayed the course (continued work since 1988)**
- **Great opportunity for knowledge integration**
- **New Products, New Concepts, New ZERO Building**

All of them

J. Lstiburek + Carmody

Kuenzel

Salonvaara

Koudelka

Crocker

J. Christian

Zalugua, Griffiths

Dellinger & Herman

J.F. Straube

Gint Mitalas

Proskiw

J. Timusk

Ian Morrison

Hugo Hens

Swinton + Maref

L. Goldberg + P. Huelman

Carl.E. Hagentoft

Kohta Ueno

M. Deru

Koudelka

M. Krati

M. Salonvaara

Nathan Mendes

Scott Ormiston

L. Lubliner

J. Kosny + A. Desjarlais

Basements

- **Need to be examined in a wholistic fashion**
- **Most complex building envelope**
- **Limited data of hygrothermal material properties (low moisture regime)**
- **Foundation loading (?) drainage-difficult to quantify**
- **Air flow ? Where are the models...**
- **Cracks ? Where are the models…**

THERMAL and MOISTURE BRIDGES

Progression/State-of-Art

- **2008 IEA Building Energy Simulation & Diagnostics Methods (IEA BESTEST)**
- **In Depth Diagnostic cases for ground coupled heat transfer related to Slab on grade construction**
- **Fluent 6, MATLAB 7, TRANSYS, BASECALC, BASESIM, GHT, VAII**

Excellent Agreement for Energy Calculation

A lot of work done (MODELING)

Thermal

- **Mitilas, Kusuda (Thermal models) 70-80's**
- **Hans Janssen (PhD. 2005 (?)) The influence of soil moisture transfer on building heat loss**
- **C.E. Hagentoft (Basements + Crawlspace) 80's**
- **Loiuse Goldberg (UMN)**
- **Karagiozis 1991 (Model)**
- **I. Morrison BASECALC (DIPAC)**
- **Wahid Maref (1995 ?-1999) Basement Thermal Model**

Some work... (MODELING)

Moisture Models

- **Kohonen and Salonvaara (1989) 2-D TRATMO**
- **Karagiozis 1991 (Model) (2-D)**
- **Hans Janssen (PhD. 2005 (?)) The influence of soil moisture transfer on building heat loss (2-D)**
- **M. Deru (PhD.) A Model for Gound Heat and Moisture Transfer from Buildings (2003) (2-D, 3-D ?)**
- **Karagiozis 2001-2007 (Integrated 2-D, Quasi 3-D Model)**
- **Kohta Ueno, Peter Bloom and Holos (WUFI-2D)**

Opportunity

- **Knoowlege is now available**
- **Data exists (Someone needs to sort out)**
- **New data need (after fully appreciating old work)**
- **Tools have progressed, the state-of-the-art can do what we need**
- **Test Existing materials**
- **HYGRO Material database for Basements**

(Need equipment like the Europeans)

Opportunity

- **New materials need exploration (Super-hygrophobic one small example)**
- **Drainage !**
- **Evaluation of low energy basement strategies as a function of climate zone.**
- **Evaluation of retrofit strategies as a function of climate zone**
- **FINALLY !! Develop a risk based assessment methodology**

Questions ?