PHOENICS软件培训

2002.5.25 北京

PHOENICS

计算传热学与计算流体力学

最佳选择

PHOENICS

世界上第一套计算流体与计算传热学商用软件

CHAM

PHOENICS

Parabolic Hyperbolic Or Elliptic
Numerical Integration Code Series

CHAM

Concentration

Heat

And

Momentum Ltd

CHAM-上海办事处

- 1999年6月在上海成立
- 目前有近200个用户

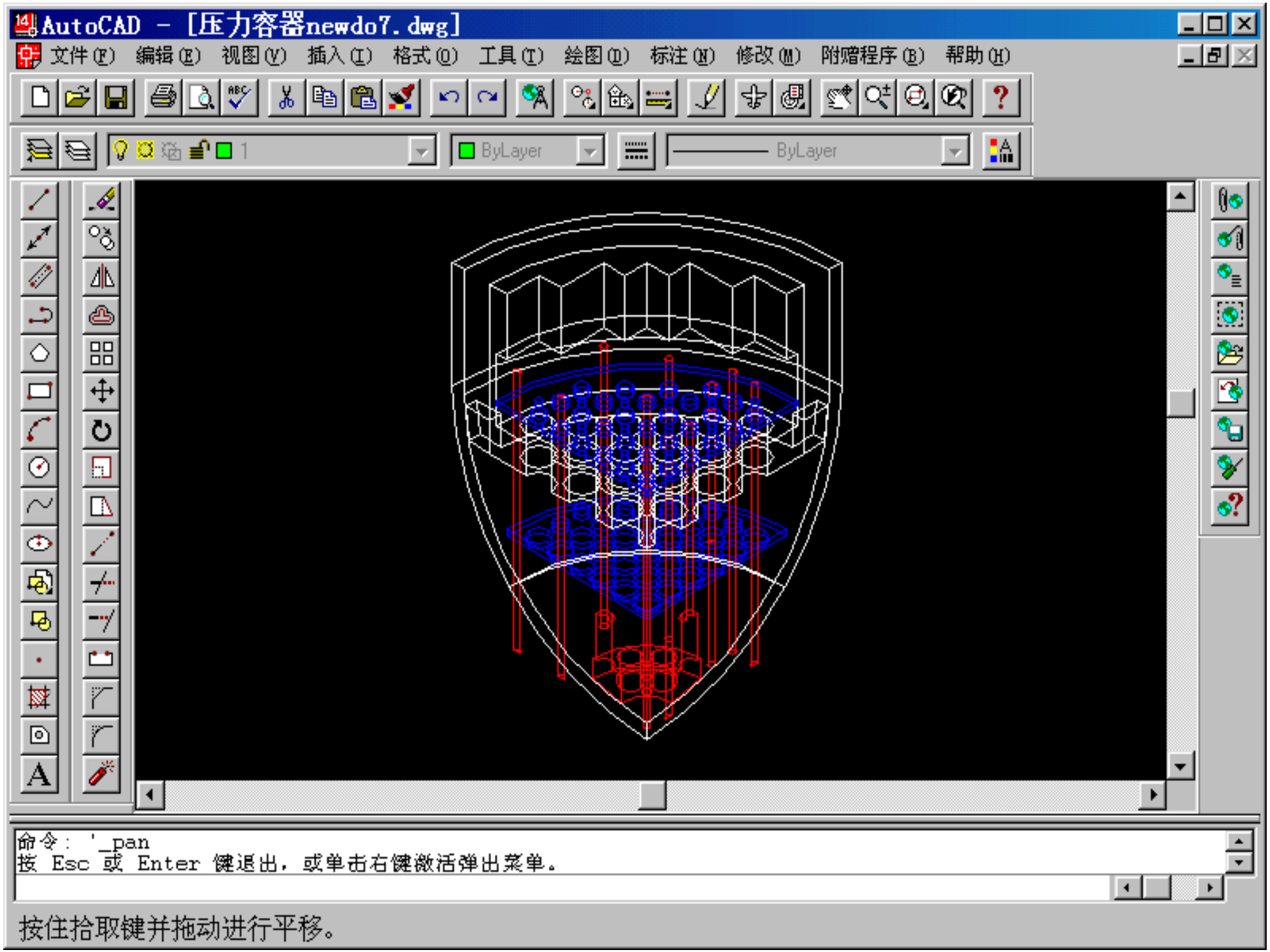
PHOENICS的应用

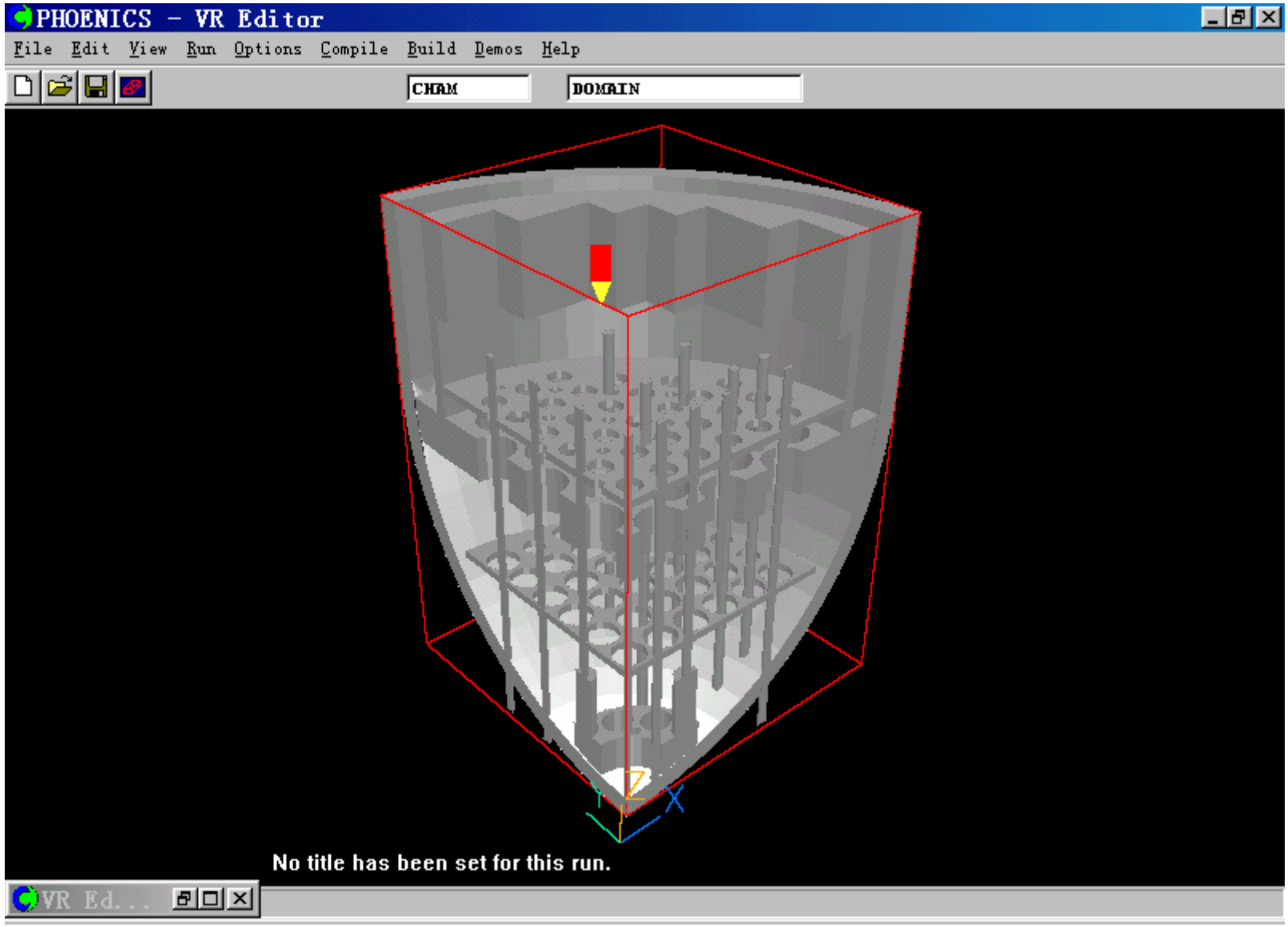
- 能源动力
- 航空航天
- 化工
- 船舶水利
- 建筑、暖通空调
- 冶金
- 环境

两相、多相流
传热传质
燃烧、爆炸
化学反应
流体机械
磁流体
材料

PHOENICS最受欢迎的方面

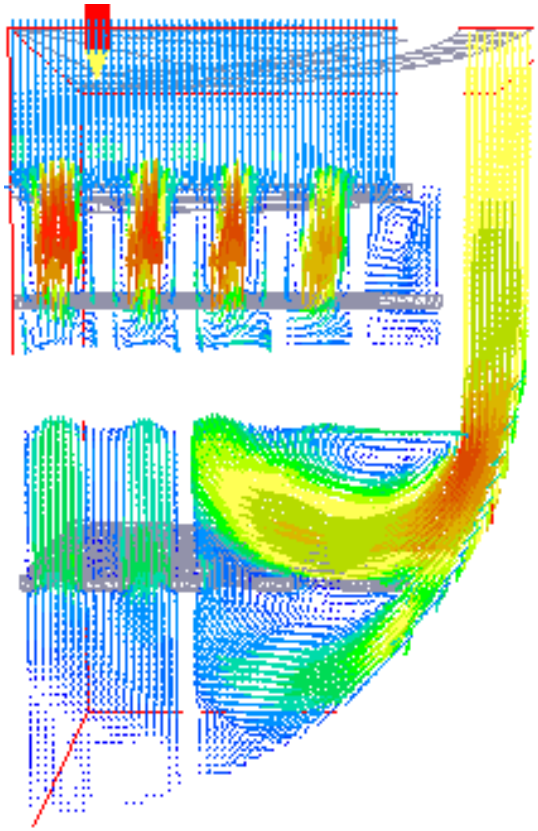
1. 与CAD的接口


AutoCAD - [压力容器newdo7.dwg]
文件(F) 编辑(E) 视图(V) 插入(I) 格式(O) 工具(T) 绘图(D) 标注(N) 修改(M) 附赠程序(B) 帮助(H)
ByLayer
ByLayer
命令: '_pan
按 Esc 或 Enter 键退出，或单击右键激活弹出菜单。
按住拾取键并拖动进行平移。

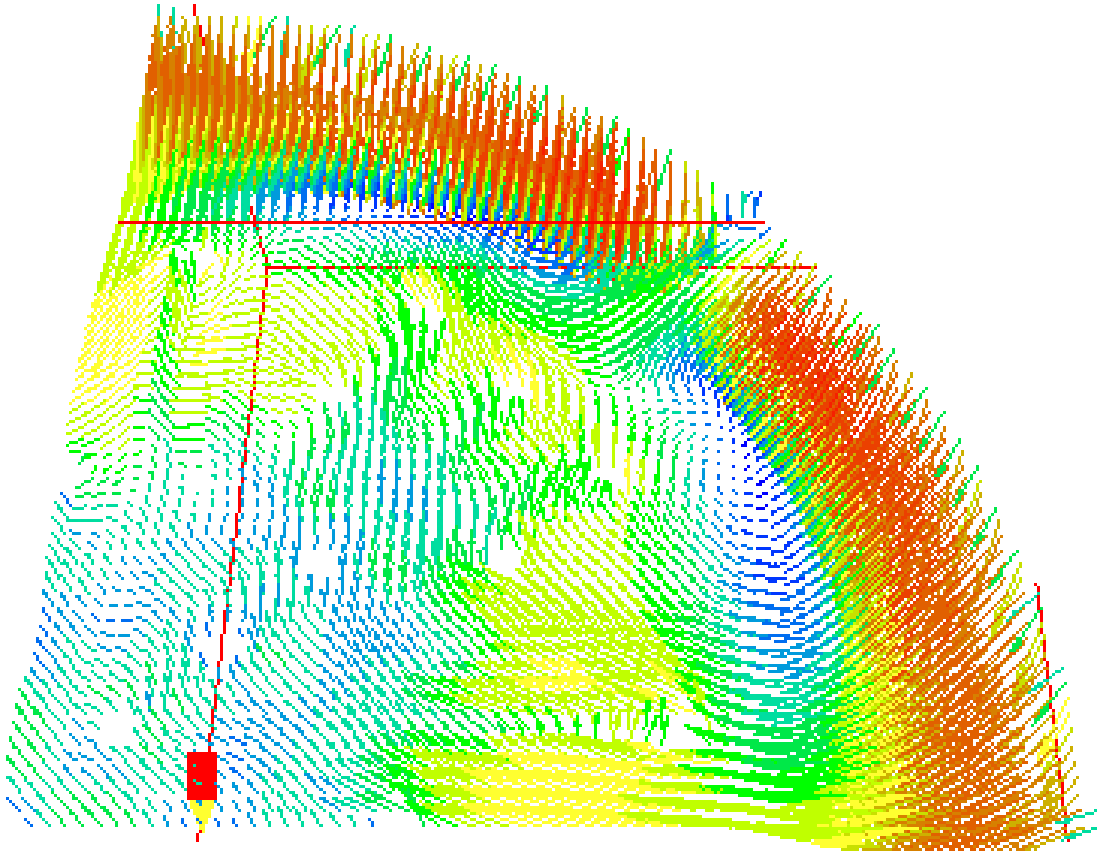

PHOENICS - VR Editor
File Edit View Run Options Compile Build Demos Help
CHAM
DOMAIN
No title has been set for this run.
VR Ed...

- 45度平面速度分布

PHOENICS计算结果



支撑键横截面速度分布



- PHOENICS计算结果
- CFX计算结果
- 1：5模型试验结果
- 相对误差均在5%以内。

PHOENICS最受欢迎的方面

2. 开放性

a. 提供了一部分原程序给用户

b. PLANT功能

c. GROUND．FOR(强大的编程功能)

d. 开发中文界面，建立专用模块

Input PLANT statements

Properties of the medium

Select physical property

density for phase 1
D(LN(DEN))/DP for phase 1
density for phase 2

Dependent variable P160

PLANT statements

DEN1=:DENC0:+:DENC1:*T1+:DENC2:*T1**2+(:DENC3:)*T1**3

Field extension units

- (●) cells and time steps
- ( ) meters and seconds

Region: cells and steps

XPOS	1	XSIZE	20
YPOS	1	YSIZE	10
ZPOS	1	ZSIZE	30
TPOS	1	TSIZE	1

Place: meters and seconds

XPOS	0.0000	XSIZE	0.0050
YPOS	0.0000	YSIZE	1.0000
ZPOS	0.0000	ZSIZE	0.0260
TPOS	0.0000	TSIZE	1.0000

Logical condition

Qualifier

OK | Variables setting | HELP | Cancel

GROUND

用户接口程序：用户可以通过GROUND编写用户子程序

- DO ISTEP=1, LSTEP ! Transience loop
- | Visit Sec 1 : start of time step
- | DO ISWEEP=1, LSWEEP ! Outer-iteration loop
- | | Visit Sec 2 : start of sweep
- | | DO IZ=1, NZ ! Single-sweep loop
- | | | Visit Sec 3 : start of IZ slab
- | | | DO ITHYD=1, LITHYD ! Hydrodynamic loop
- | | | | Visit Sec 4 : start of iteration
- | | | | Solve equations
- | | | | Visit Sec 5 : finish of iteration
- | | | END DO
- | | | Visit Sec 6 : finish of IZ slab
- | | END DO
- | | Visit Sec 7 : finish of sweep
- | END DO
- | Visit of Sec 8 : finish of time step
- END DO

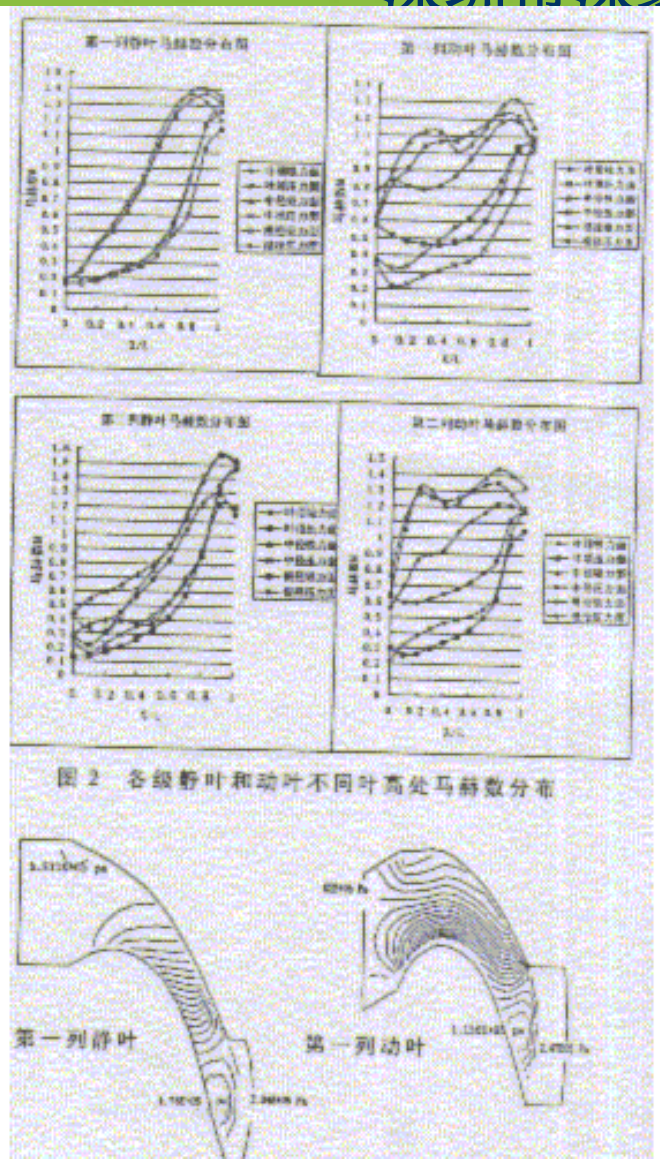
PHOENICS最受欢迎的方面

3. 两(多)相流方面有独到功能

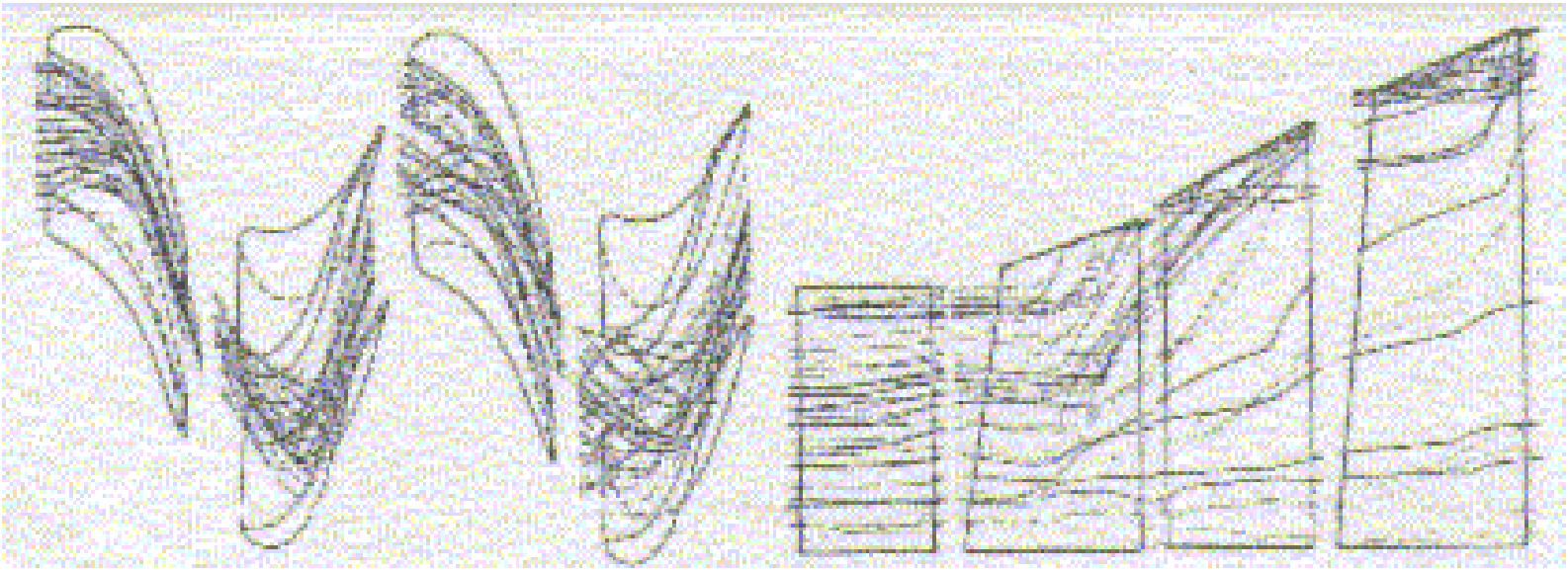
欧拉法、拉格朗日法

带粒燃气透平气固双向耦合湍流 叶片冲蚀的数值模拟

- 双级跨音速燃气透平三元粘性湍流
- 颗粒随机轨道模型和PSIC法求解低颗粒浓度气固双向耦合后分布直径颗粒的运动轨迹
- 冲蚀率统计模型分析叶片冲蚀规律
- 入口马赫数0.17，总压594300Pa，总温1033K，叶轮旋转角速度825.2 1/s
- 10万个分布粒径颗粒



各级静叶和动叶不同高处马赫数分布



- 分布直径颗粒运动轨迹

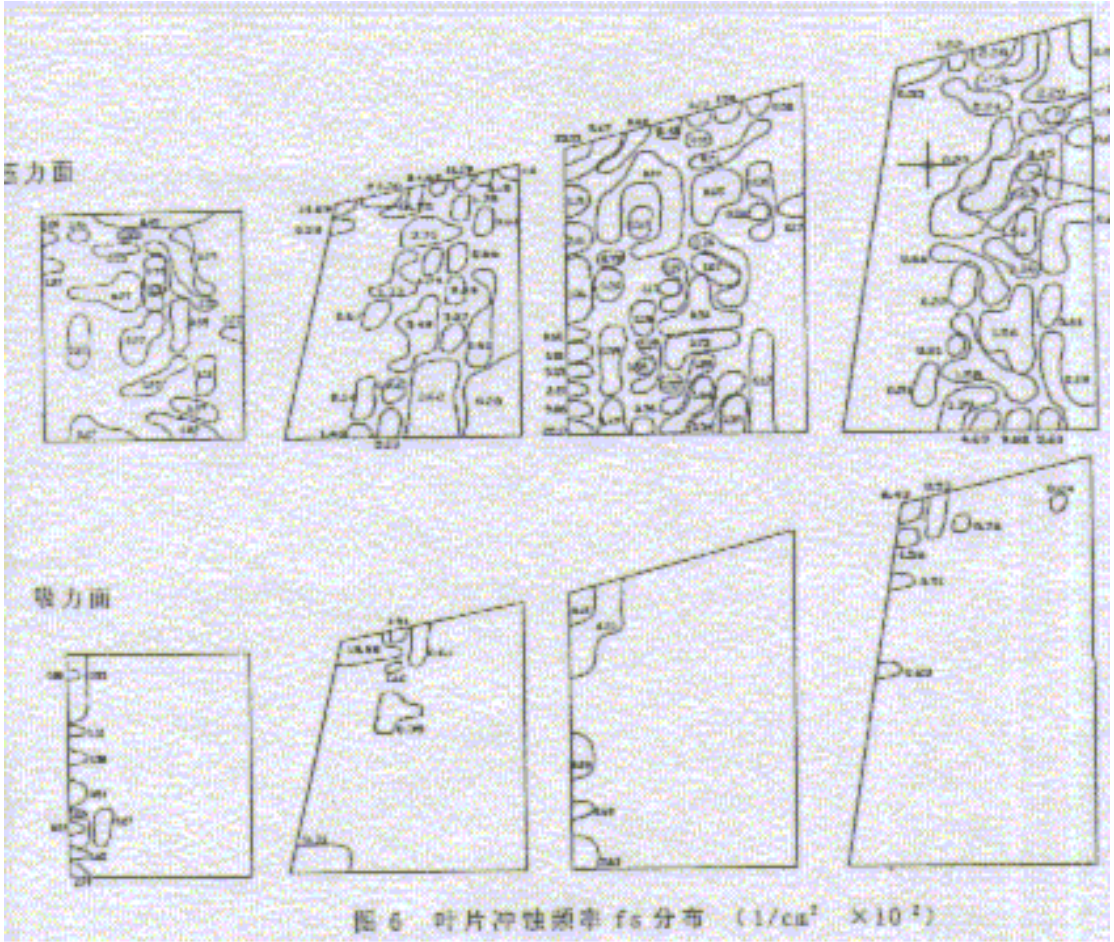


图 6 叶片冲蚀频率 fs 分布 (1/cm² ×10⁻²)

叶片冲蚀平率分布

PHOENICS最受欢迎的方面

4. 与其他程序良好的接口功能

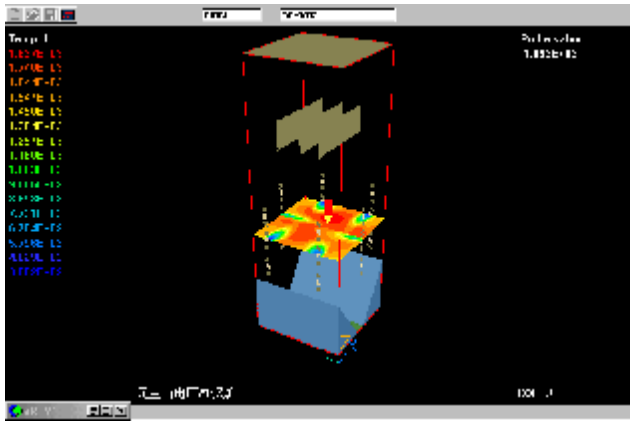
- GRIDGEN
- TECPLOT、 FIELDVIEW

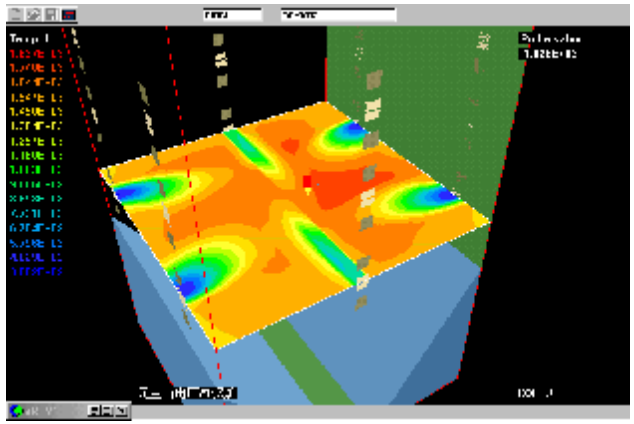
PHOENICS专用模块

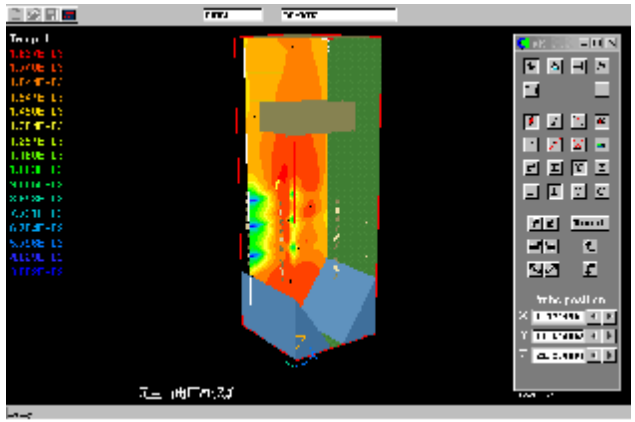
PHOENICS-COFFUS

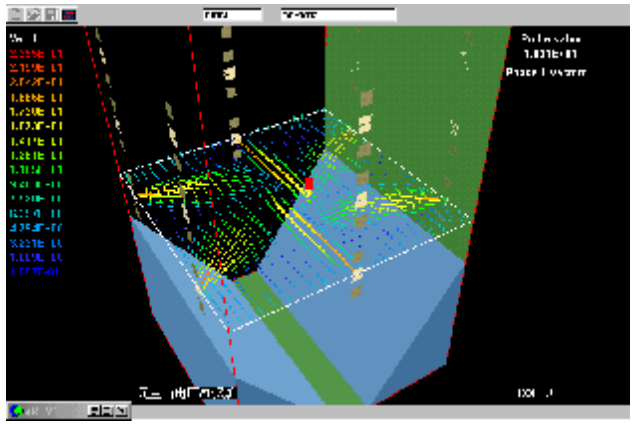
燃煤锅炉炉膛燃烧模拟专用模块

国内某研究机构300MW褐煤锅炉

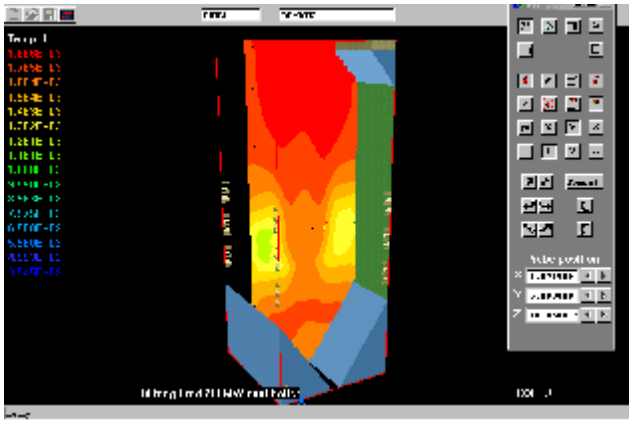


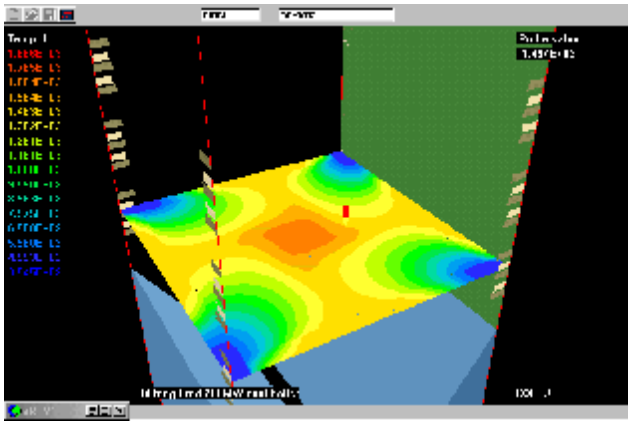


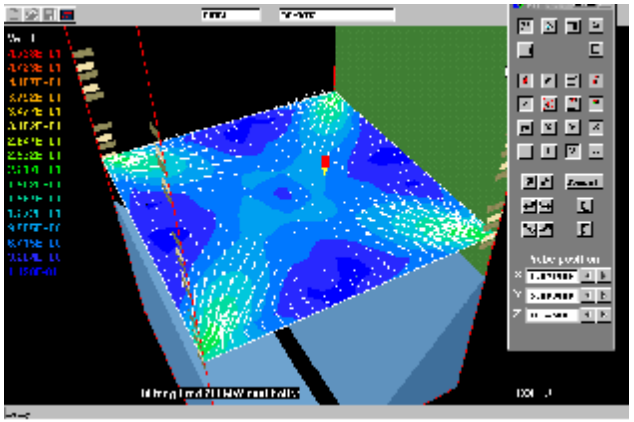


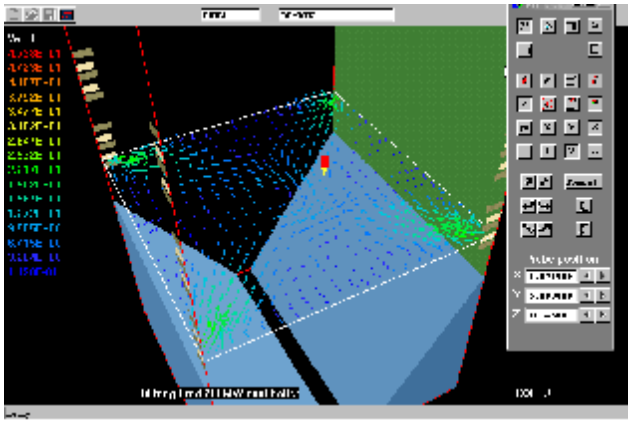


哈尔滨工业大学所做200MW烟煤锅炉数值模拟

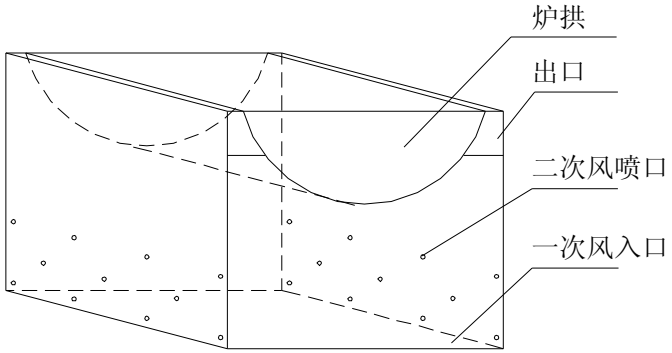


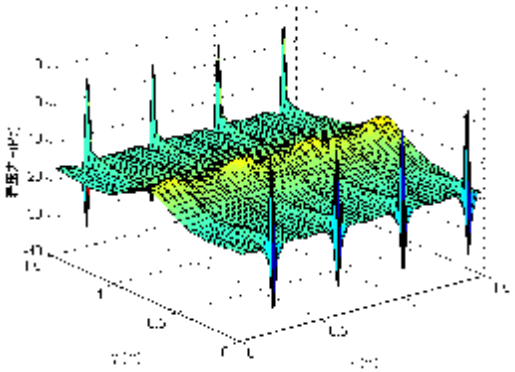


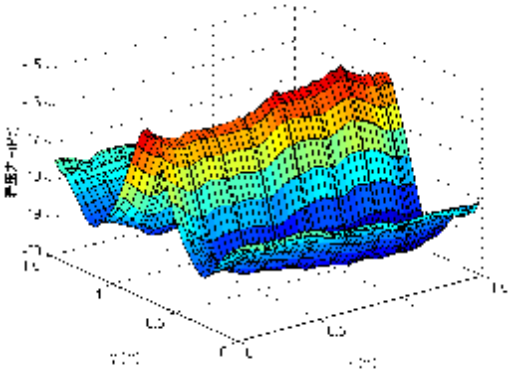


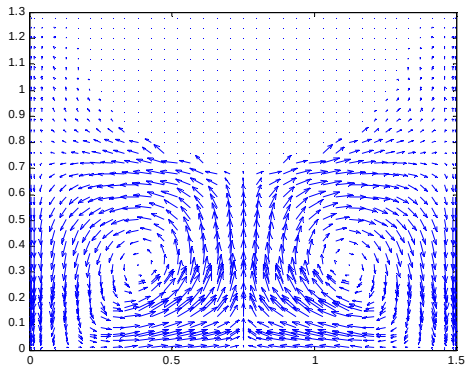


东北电力学院卧式煤无烟燃烧锅炉炉内冷态流场的数值模拟









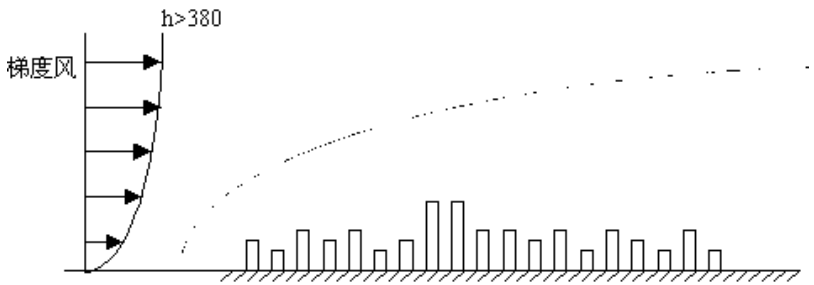
PHOENICS专用模块

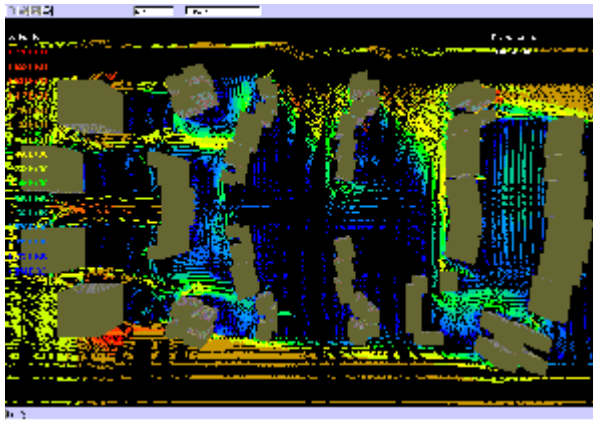
PHOENICS-FLAIR

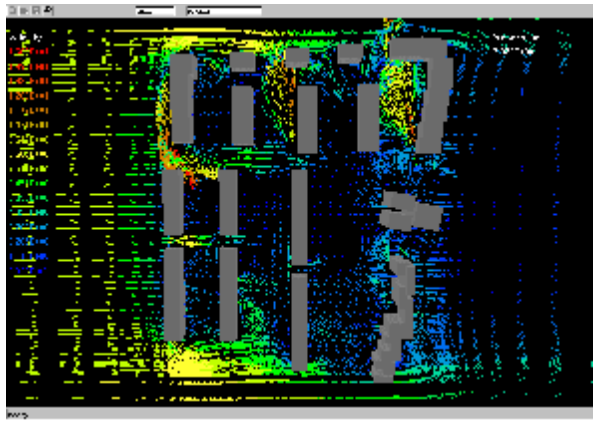
建筑环境、暖通空调专用模块

北京东润枫景小区内气流流场的数值模拟分析

清华大学建筑技术科学系

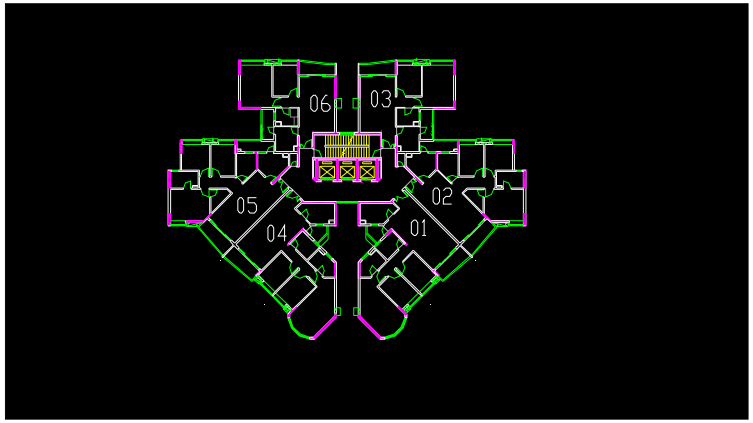


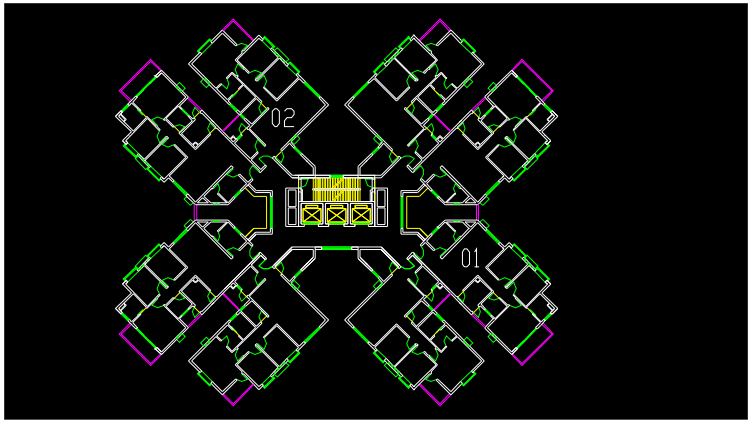


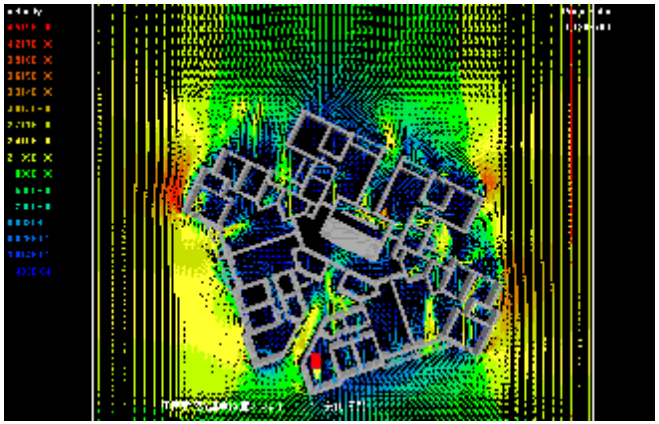


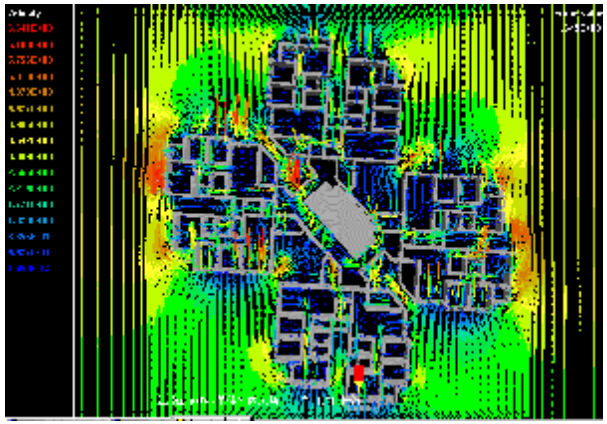
江南新苑住宅小区单体自然通风分析报告

华南理工大学建筑系



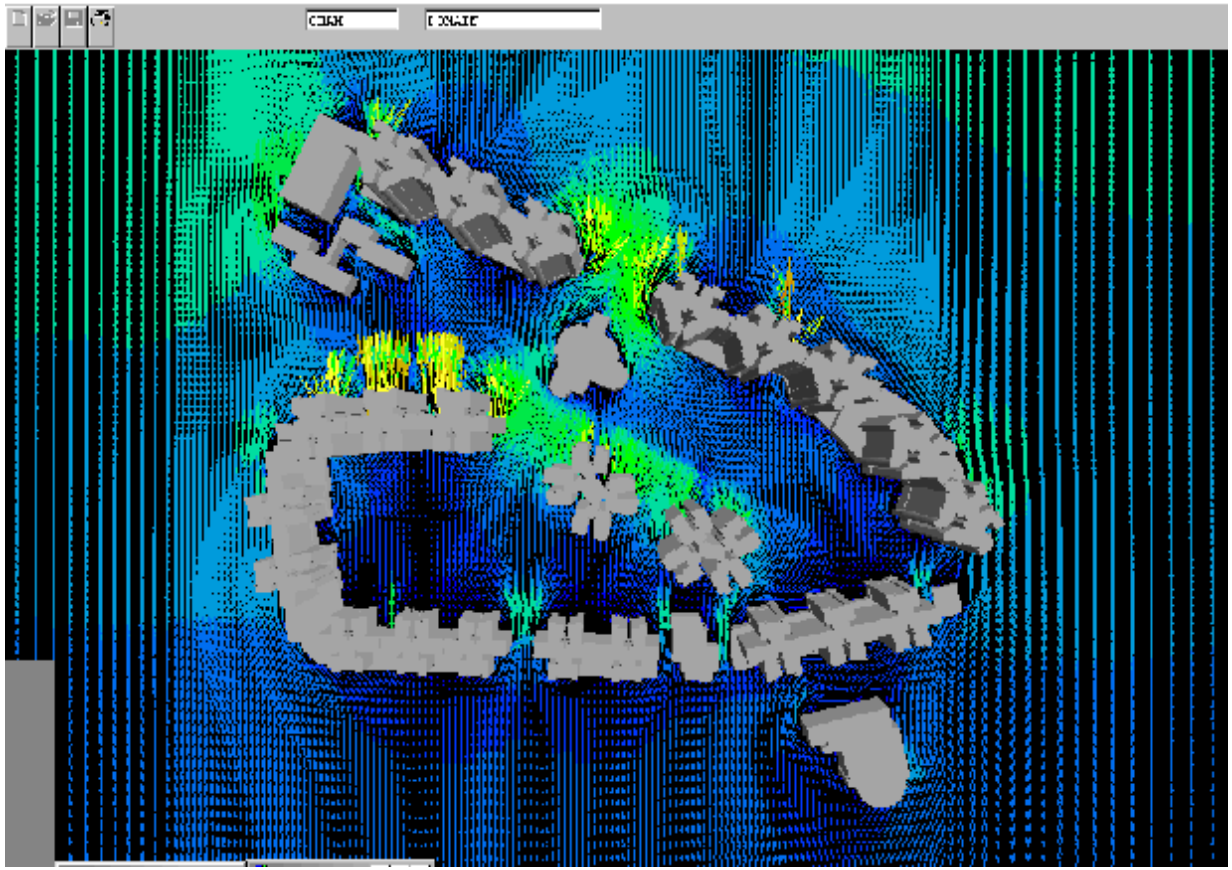




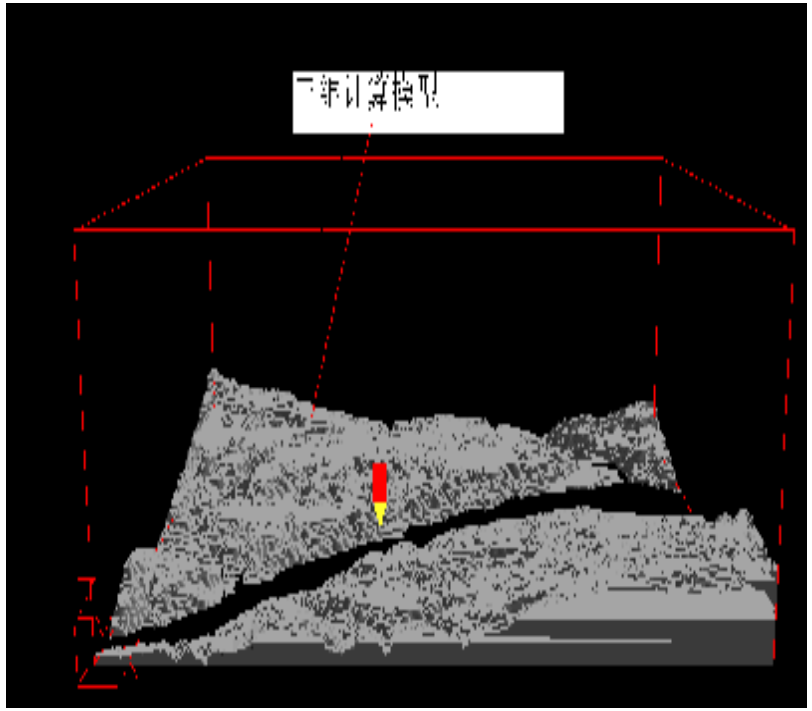


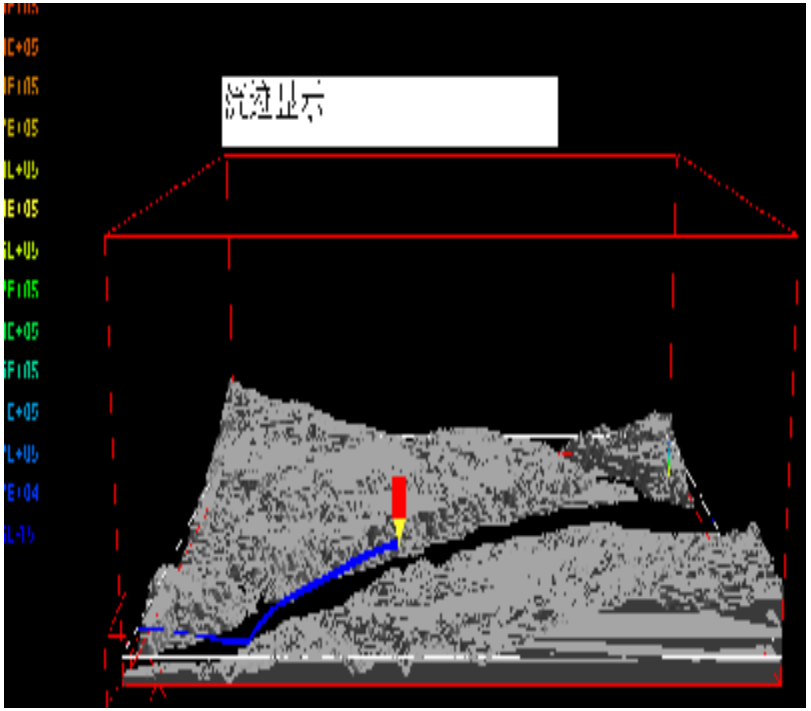
15城区环境模拟

华南理工大学建筑系



西南交通大学风工程中心





大中型商场夏季两种送风方式的对比分析

哈尔滨工业大学市政环境工程学院

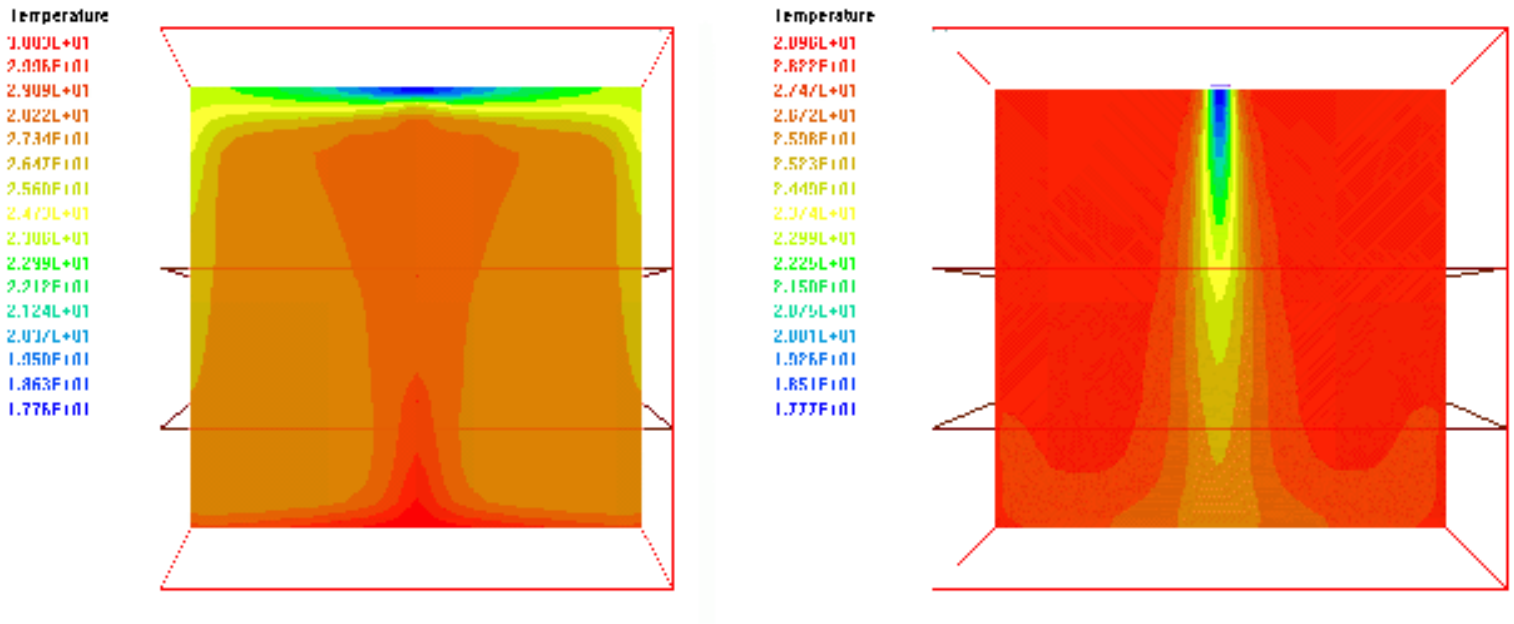
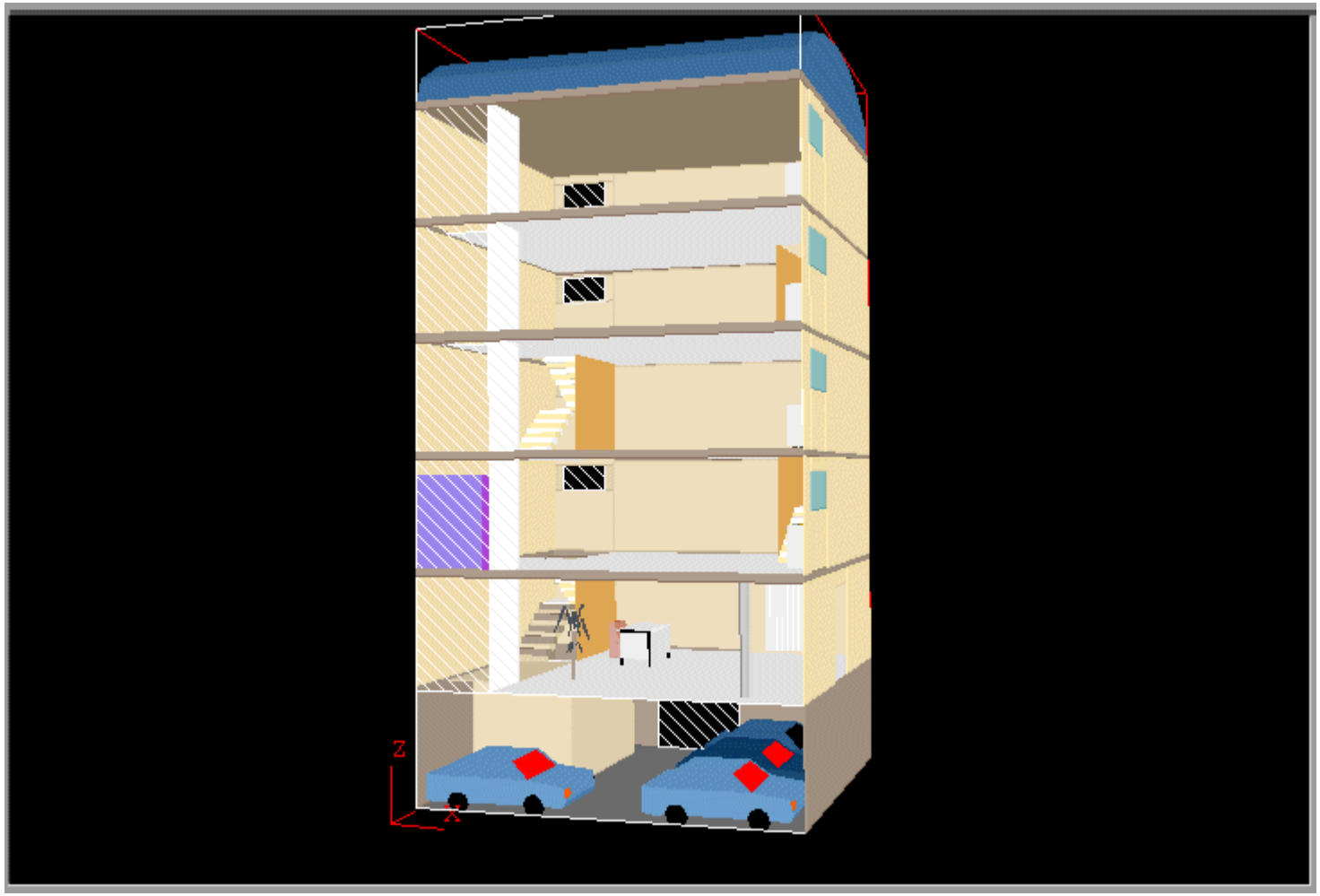
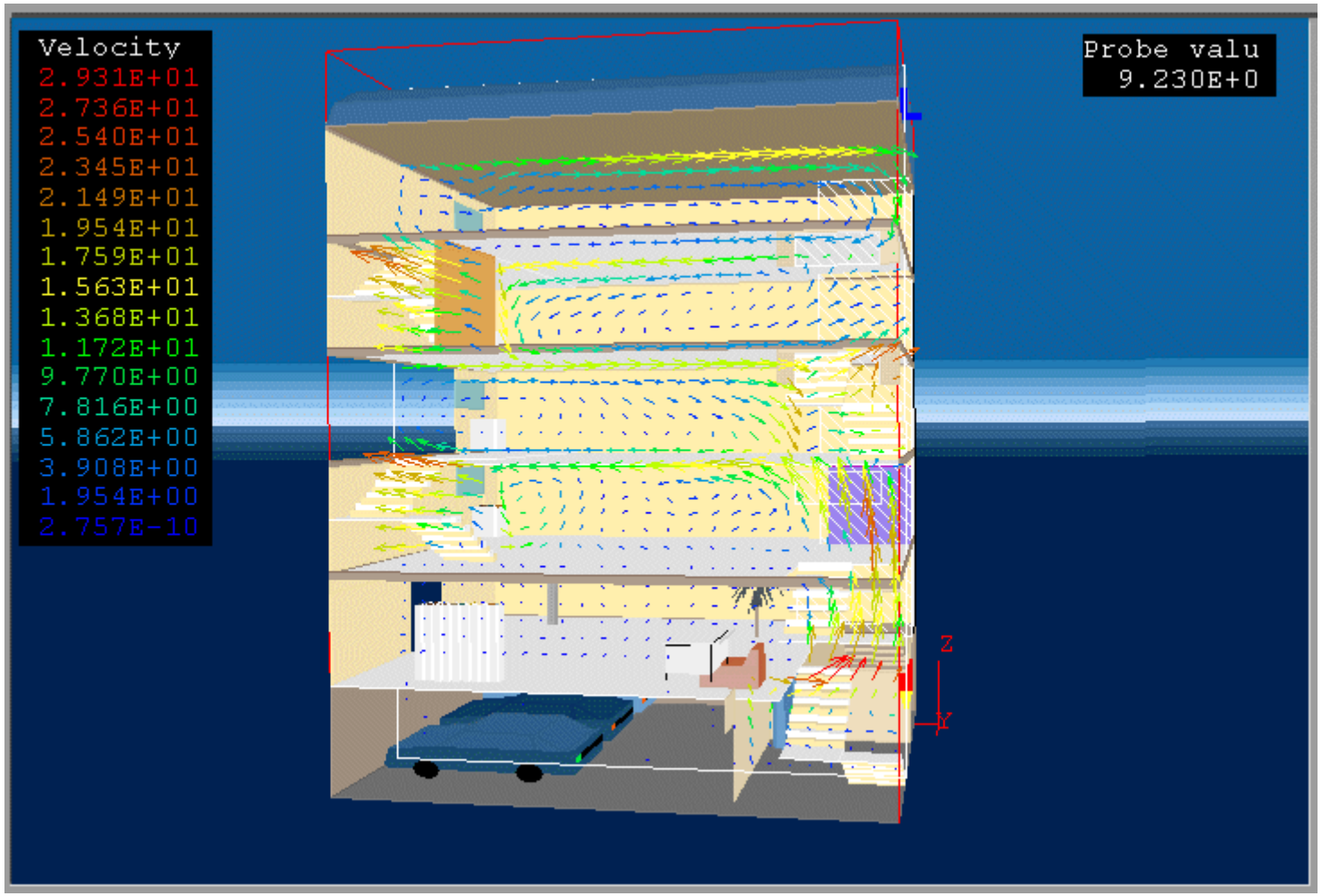
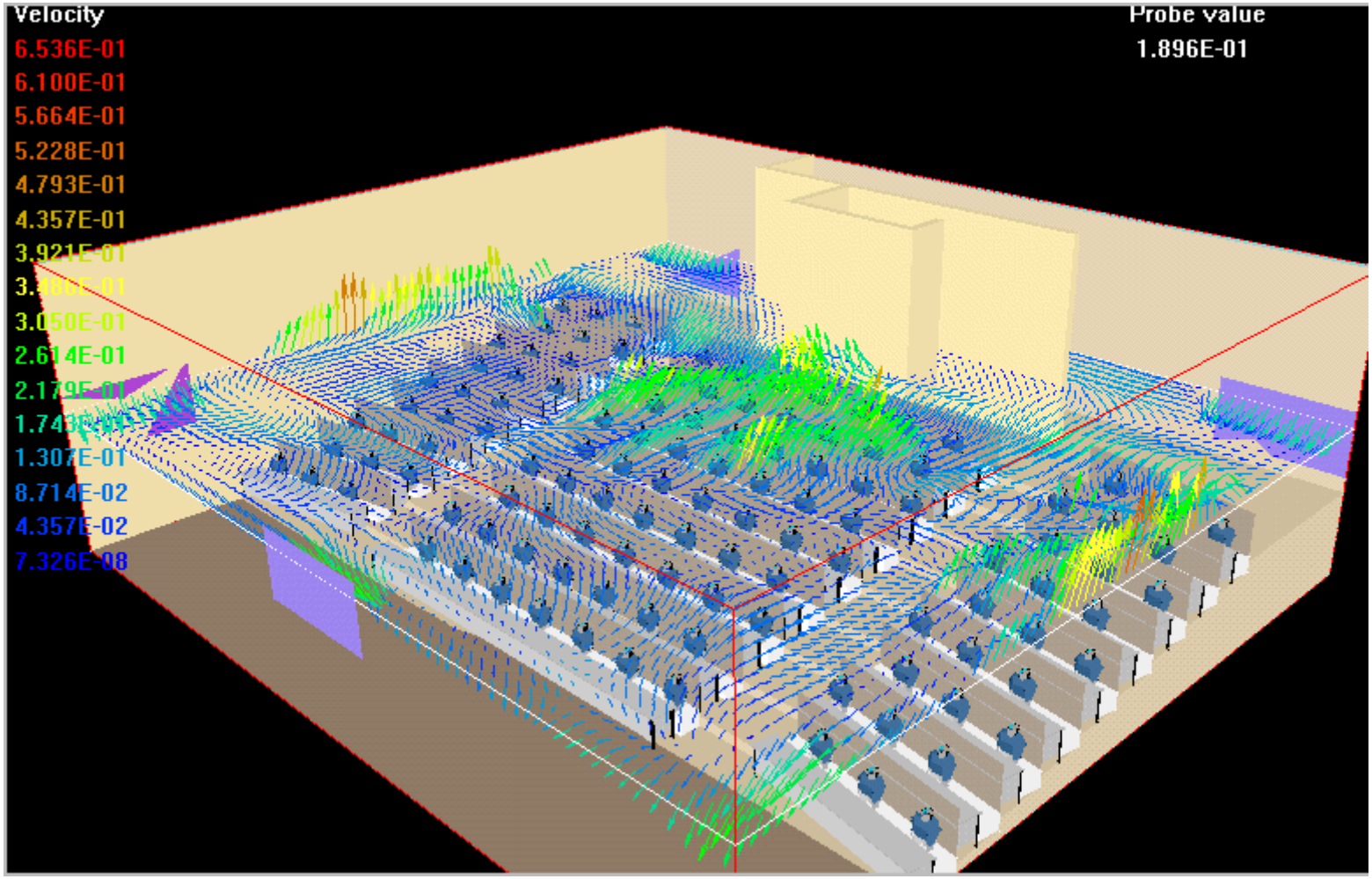
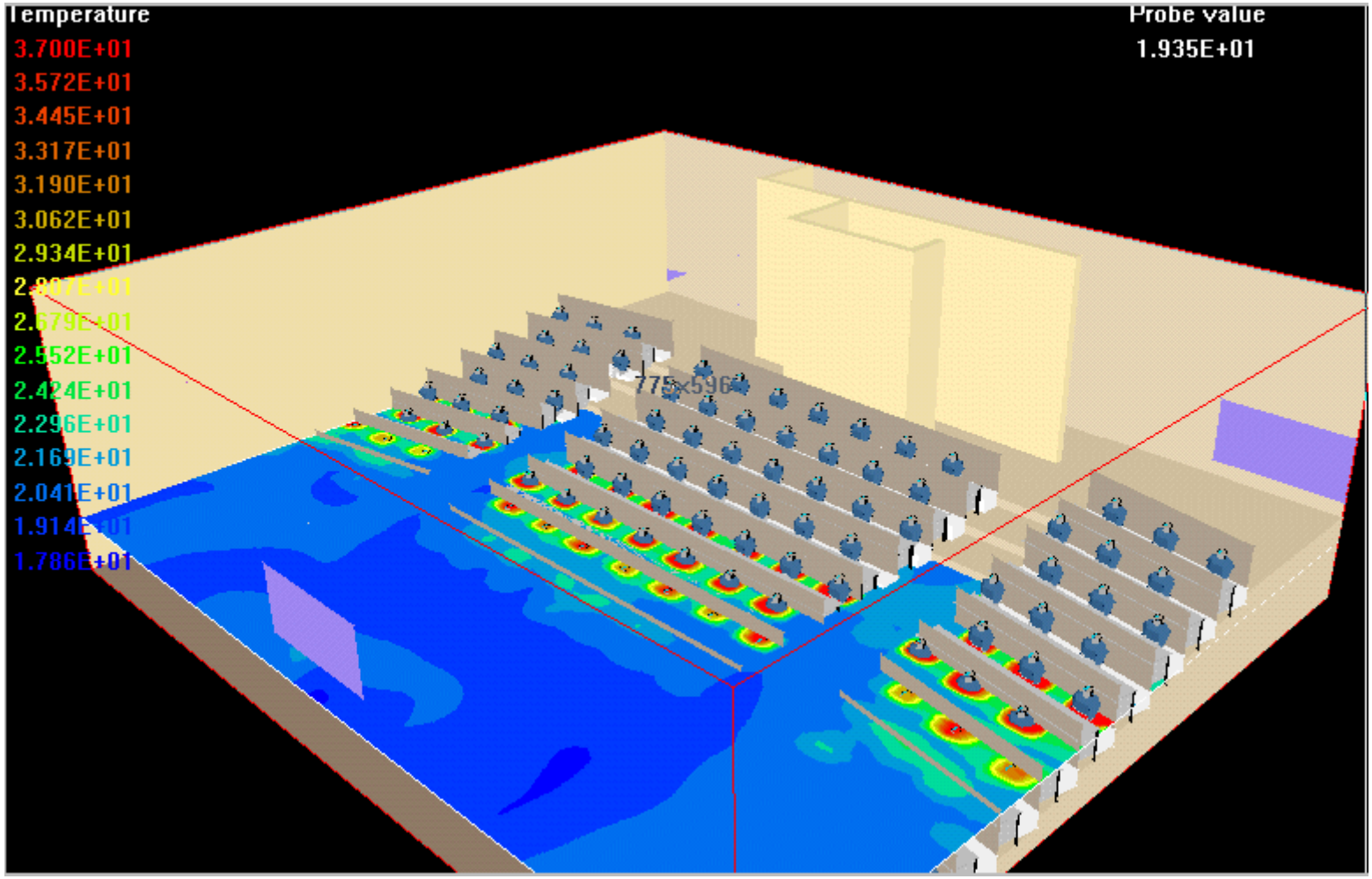


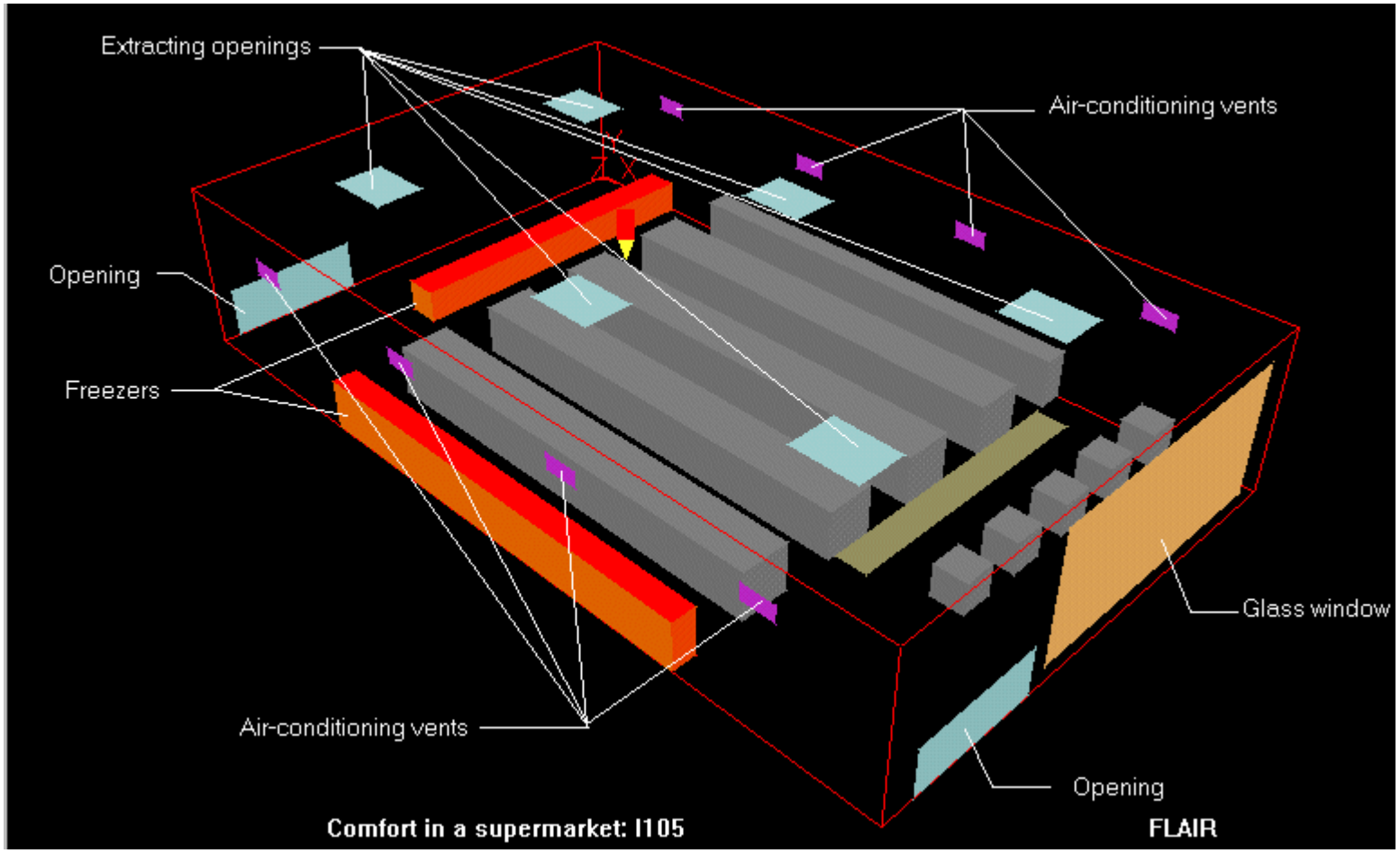
图4　X = 0.0 m 纵剖面处散流器送风温度场

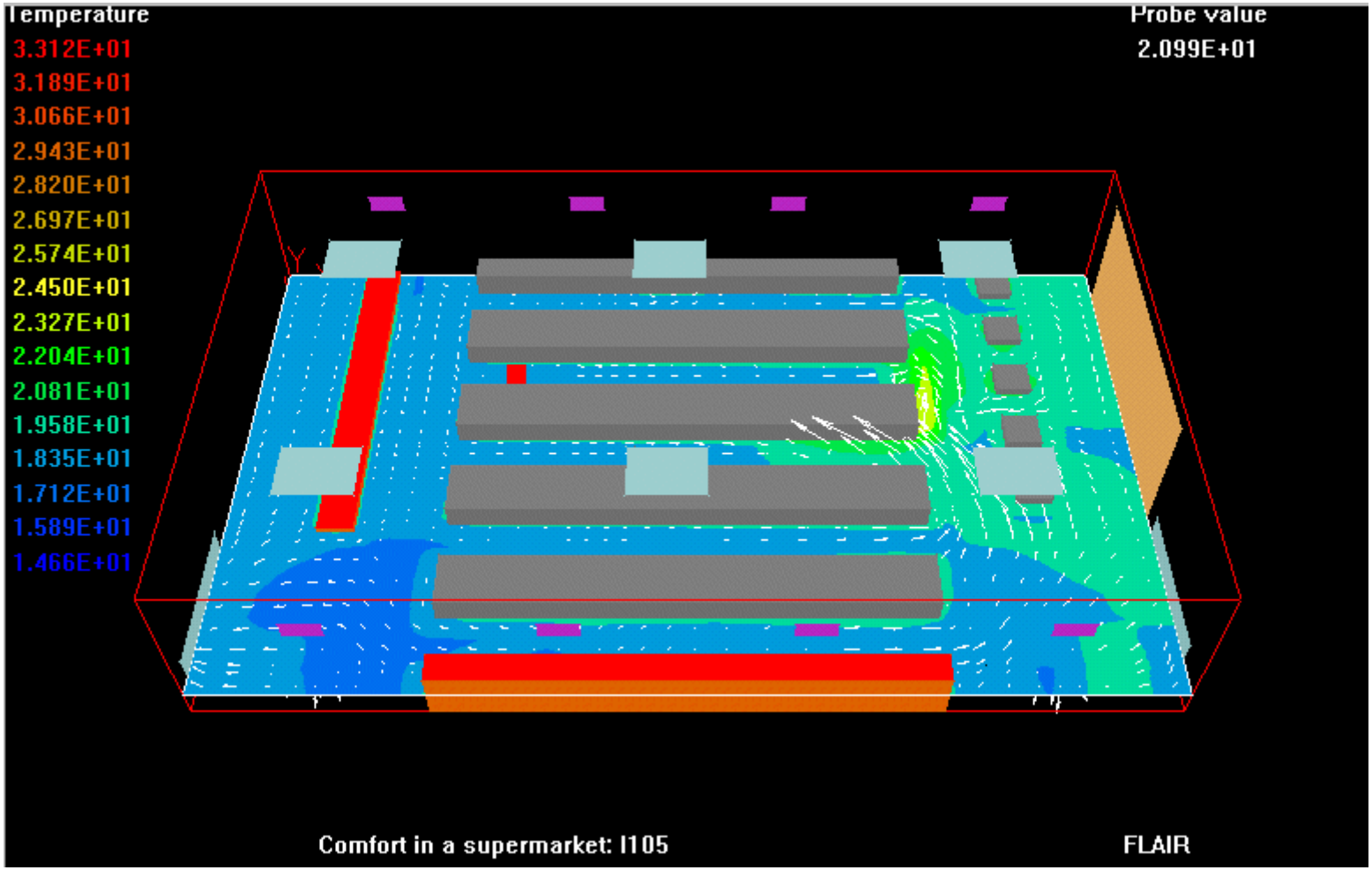

Z
X


Velocity
2.931E+01
2.736E+01
2.540E+01
2.345E+01
2.149E+01
1.954E+01
1.759E+01
1.563E+01
1.368E+01
1.172E+01
9.770E+00
7.816E+00
5.862E+00
3.908E+00
1.954E+00
2.757E-10
Probe valu
9.230E+0
Z
Y


Velocity
6.536E-01
6.100E-01
5.664E-01
5.228E-01
4.793E-01
4.357E-01
3.921E-01
3.486E-01
3.050E-01
2.614E-01
2.179E-01
1.743E-01
1.307E-01
8.714E-02
4.357E-02
7.326E-08
Probe value
1.896E-01


Temperature
3.700E+01
3.572E+01
3.445E+01
3.317E+01
3.190E+01
3.062E+01
2.934E+01
2.807E+01
2.679E+01
2.552E+01
2.424E+01
2.296E+01
2.169E+01
2.041E+01
1.914E+01
1.786E+01
Probe value
1.935E+01
775x596


Extracting openings
Air-conditioning vents
Opening
Freezers
Glass window
Air-conditioning vents
Opening
Comfort in a supermarket: I105
FLAIR


Temperature
3.312E+01
3.189E+01
3.066E+01
2.943E+01
2.820E+01
2.697E+01
2.574E+01
2.450E+01
2.327E+01
2.204E+01
2.081E+01
1.958E+01
1.835E+01
1.712E+01
1.589E+01
1.466E+01
Probe value
2.099E+01
Comfort in a supermarket: I105
FLAIR

目前在进行当中的项目

- 第10界全国运动会体操馆、游泳馆
- 新疆体育馆
- 奥运会场馆

PHOENICS专用模块

- ***CVD***---chemical-vapor-deposition reactors
- ***ESTER***---electrolytic aluminum smelters
- ***EXPLOITS***---explosion, blast, gas-dispersion and fires in off-shore
- ***FLAIR***---flow of air, heat and smoke inside buildings
- ***GENMIX***---two-dimensional steady flow in jets, wakes and boundary layers
- ***HOTBOX***---flow of heat and air in electronic equipment
- ***PISA***---flow, combustion and heat flow in gasoline and diesel engines
- ***ROSA***---oil spills in rivers
- **SAFIR**---blast-furnaces
- ***TACT***---natural-draft cooling towers
- ***VWT***---the virtual wind tunnel, for flow around buildings
- **COFFUS**---coal fired furnace

PHOENICS的应用

冶金、铸造、焊接

NUMERICAL SIMULATION OF MELTING PROCESS OF ERROSILICON BLOCK IN THE LIQUID IRON UNDER FORCED CONVECTTION

湖北汽车学院 西安交通大学

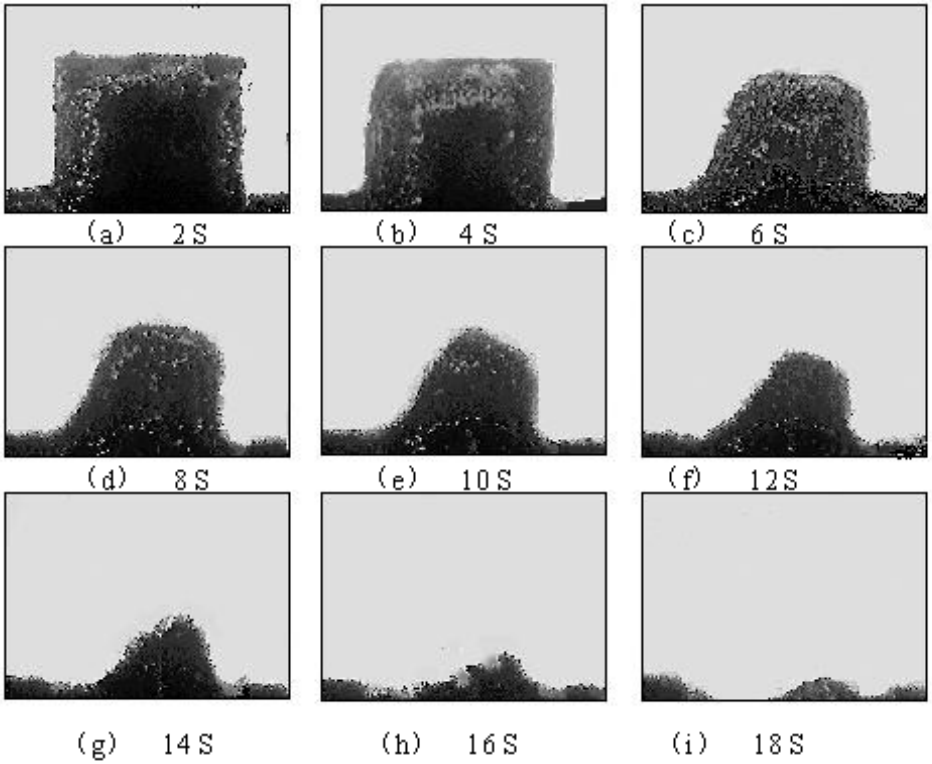


Fig. 2 Experimental moving interface during melting of ferrosilicon block in forced convective liquid iron at 1450℃

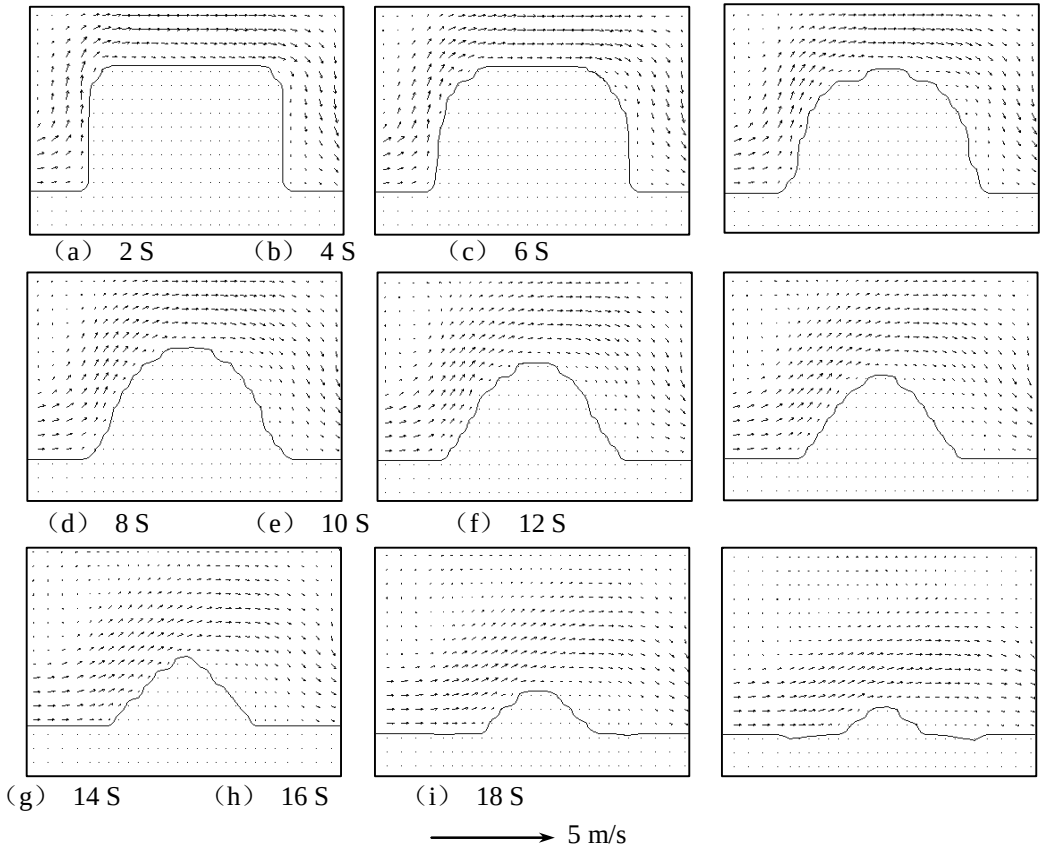


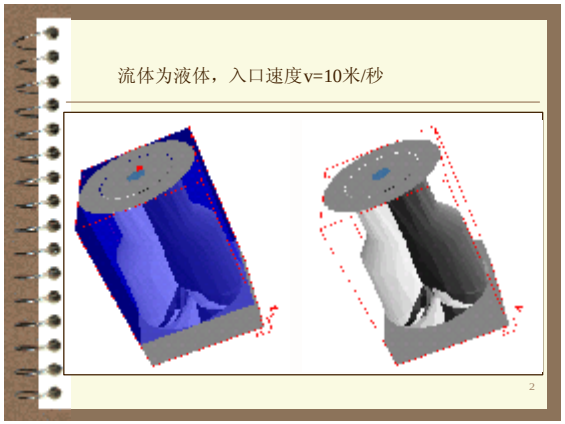
Fig. 3 Computed moving interface during melting of ferrosilicon block in forced convective liquid iron at 1450℃

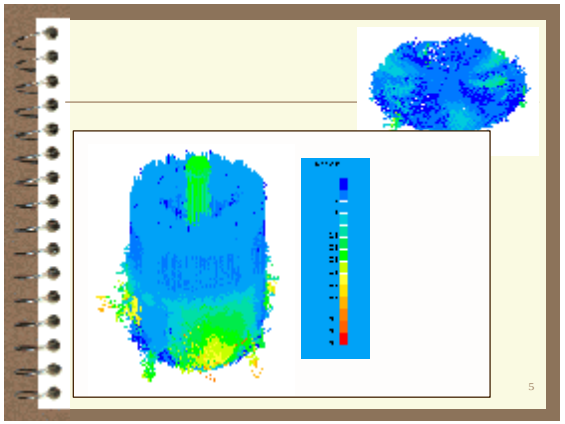
PHOENICS的应用

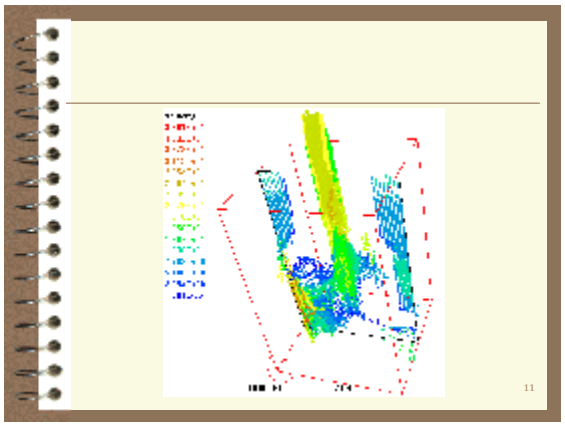
石油、化工

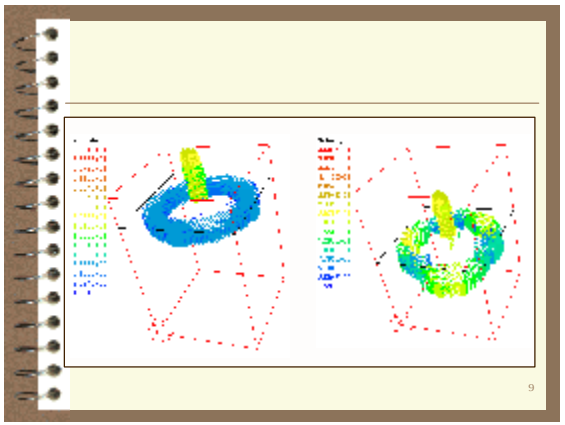
钻头数值模拟

西南石油学院





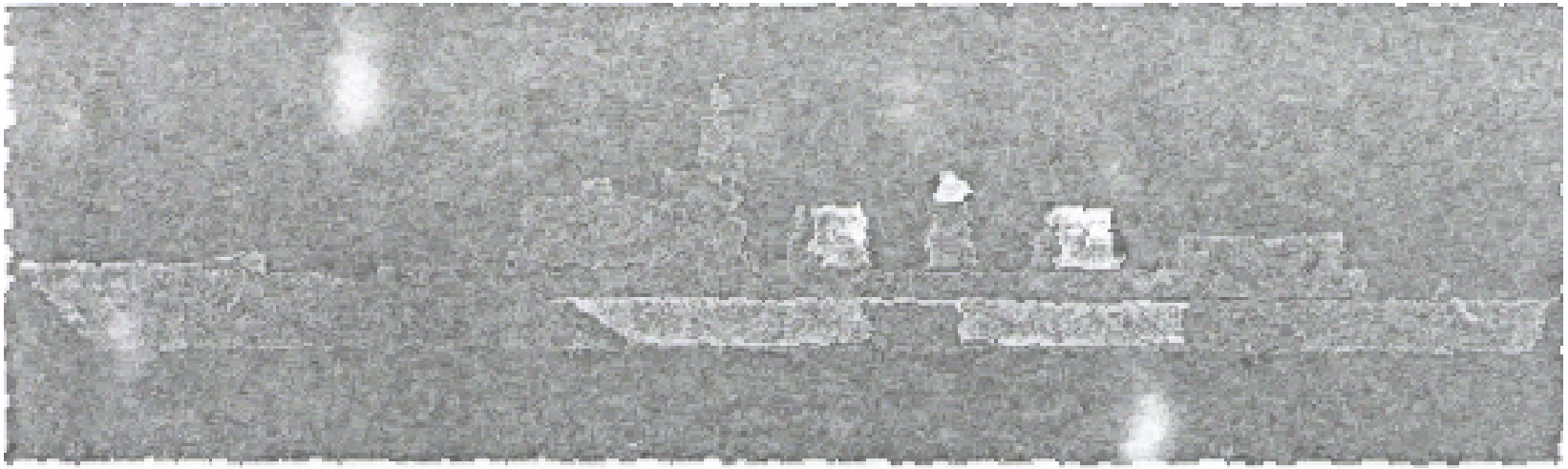




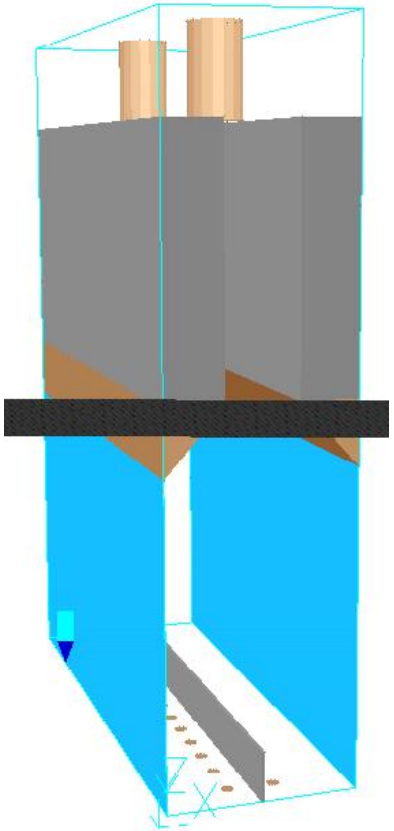
PHOENICS的应用

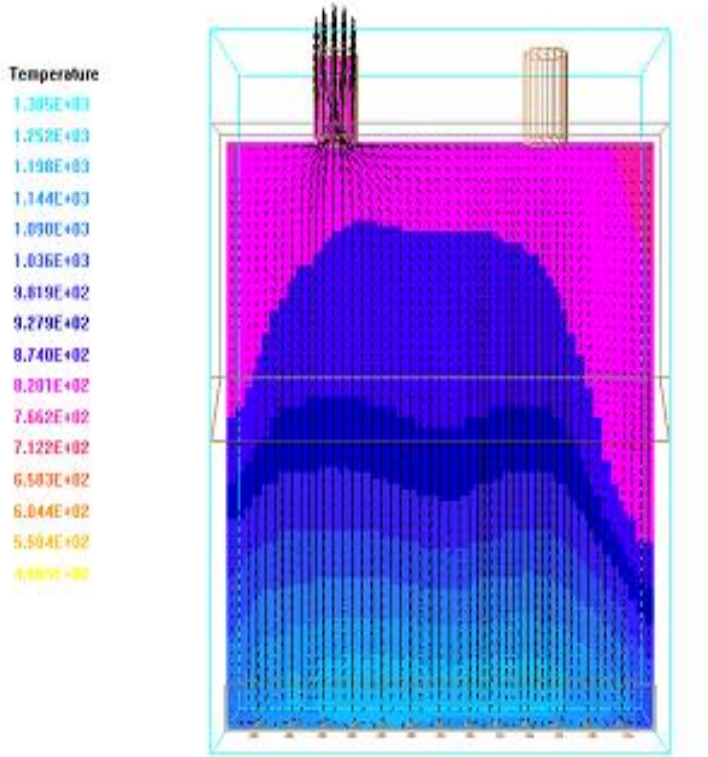
太阳辅照下船舶表面温度场的数值计算

中科院工程热物力所



予混燃烧器
（中国科技大学）





PHOENICS的应用

- 磁流体力学(等离子体)
  (复旦大学)

PHOENICS版本

1、网络版

（联网终端都可以使用PHOENICS程序）

适合于CFD实验室，一个部门或一个单位。

PHOENICS版本

2、并行计算版本

Parallel:

2-processor PCs go twice as fast as one

PHOENICS程序优惠的价格

与其他国际通用软件的比较

- PHOENICS可以成为用户自己的程序
- VR界面解决某些工程问题非常简单
- 理论公开
- 使CFD走向大众（网络版）
- 成为PHOENICS高手需要努力
- 使用简单是以牺牲某些利益为代价
- 每个软件都有自己成熟的领域和市场