

---

**calcifer**  
*Release 0.1.1,*

**Team COOP**

**Oct 08, 2020**



---

## Contents

---

<b>1</b>	<b>Thermal diffusion, solver by calcifer.</b>	<b>3</b>
<b>2</b>	<b>calcifer_pde package</b>	<b>5</b>
2.1	Submodules . . . . .	5
2.2	calcifer_pde.boundary module . . . . .	5
2.3	calcifer_pde.calcifer module . . . . .	5
2.4	calcifer_pde.diff module . . . . .	5
2.5	calcifer_pde.domain module . . . . .	5
2.6	calcifer_pde.geometry module . . . . .	5
<b>3</b>	<b>Indices and tables</b>	<b>7</b>



*Under construction*

Calcifer is a Poisson-like PDE finite difference solver on 2-D structured I.J Grids. Grids are curvilinear.

- create a **Geometry** object.
- define the computational **Domain**, based upon this **Geometry**.
- Solve the problem. Heat conduction is solver in **HeatSolve** from Calcifer.



---

## Thermal diffusion, solver by calcifer.

---

A thermal diffusion test with calcifer is done like this:

```
from calcifer_pde.domain import Domain
from calcifer_pde.geometry import Square

def heat_solve(dom, k_coeff=1.0):
    init_field = np.random.random_sample(dom.shp1d)
    sterm_l = np.zeros_like(dom.lapl)
    sterm_r = np.zeros(dom.shp1d)
    # Left Hand Side
    lhs_csr = dom.lapl * k_coeff + sterm_l
    # Right-Hand Side
    rhs_csr = np.zeros(dom.shp1d) + sterm_r
    lhs_csr_bc, rhs_csr_bc, grad_n_bc = apply_bc(dom, lhs_csr, rhs_csr)

    out_ld, info = scp.linalg.bicgstab(lhs_csr_bc, rhs_csr_bc, x0=init_field)
    if info == 0:
        print(".  ^^ Resolution succesfull.")
    elif info > 0:
        print(".  t(-_t) Resolution failed.")
    else:
        print(".  == Convergence not reached.")
    temp = out_ld.reshape(dom.shp2d)
    return temp

geo = Square(nx=80, ny=100, len_x=1.0, len_y=1.0)
dom = Domain(geo)
dom.switch_bc_vmax_neuman(0.0)
dom.switch_bc_vmin_neuman(0.0)
dom.switch_bc_umin_dirichlet(200.0)
dom.switch_bc_umax_dirichlet(100.0)
sol = heat_solve(dom, k_coeff=22.0)
```

One can solve an other PDE by creating a different problem than `heat_solve`





### **2.1 Submodules**

#### **2.2 calcifer\_pde.boundary module**

#### **2.3 calcifer\_pde.calcifer module**

#### **2.4 calcifer\_pde.diff module**

#### **2.5 calcifer\_pde.domain module**

#### **2.6 calcifer\_pde.geometry module**



## CHAPTER 3

---

### Indices and tables

---

- `genindex`
- `modindex`
- `search`