

## Own related work

Several parts of this monograph are related to published studies:<sup>14</sup> most of them in peer-reviewed journal papers, some as peer-reviewed conference papers, some non-reviewed work (GAMM Leitartikel or lecture notes), and some under current review. My own contributions to phase-field fracture, multiphysics extensions, and collaborations<sup>15</sup> can be roughly divided into the following categories:

1. *Basic concepts in phase-field fracture numerical modeling:*
  - (a) Crack irreversibility constraint with simple penalization [323], augmented Lagrangian [430], primal-dual active methods [221], and complementarity systems [301]
  - (b) Higher-order finite elements [301, 249]
  - (c) Mixed formulations for (nearly) incompressible fracture [301, 42]
  - (d) Monolithic [444, 445], quasi-monolithic [221, 444], and iterative coupling schemes [88, 154, 247] of the displacement/phase-field system
  - (e) Nonlinear monolithic solvers [444, 445]
  - (f) Parallel multigrid preconditioners [222] (AMG) and [250, 249] (matrix-free GMG)
2. *Adaptive modeling, error control, and local mesh refinement:*
  - (a) Predictor-corrector scheme for mesh refinement around the crack [221] (2d), [448, 285] (3d)
  - (b) Residual-based error estimators [299, 42]
  - (c) Goal-oriented error estimators [442]
  - (d) Multiple goal functionals for the perfect slit (not yet phase-field) [153]
  - (e) Adaptive nonintrusive global-local approach [341, 9]
  - (f) Adaptive time/loading step control [443, 159]
3. *Numerical optimization with phase-field fracture*<sup>16</sup>
  - (a) Optimal control [336, 337]
  - (b) Parameter estimation [259, 342]
4. *Engineering applications:*
  - (a) Fracture and damage in screws [433]
  - (b) Fracture and damage in nearly incompressible rubber-like solids [298, 301]
  - (c) One-way coupling to a reservoir simulator in porous media [450]
  - (d) Fracture initialization with probability maps [287]
  - (e) Uniaxial compression test with inclined notch [160]

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<sup>14</sup> Complete publication lists on <http://www.thomaswick.org/>

<sup>15</sup> All of these collaborations are highly appreciated and they are influential in this monograph.

<sup>16</sup> Numerical optimization will not be touched in this monograph. For details, I refer immediately to the four listed papers/preprints [336, 337, 259, 342] and in multiphysics fluid-structure interaction to [378, 452] and recent differentiability results for stationary problems [451].

5. *Multiphysics modeling and applications:*
  - (a) Mathematical and numerical modeling of pressurized fractures in porous media [324, 323, 448, 285, 9]
  - (b) Mathematical and numerical modeling of fluid-filled fractures in porous media [321, 322, 285, 286, 14]
  - (c) Nonlinear porous media phase-field fracture [425]
  - (d) Transport flow in phase-field fractures in porous media [286]
  - (e) Two-phase flow in phase-field fractures in porous media [280]
  - (f) Nonisothermal modeling of pressurized fractures in porous media [343]
  - (g) Coupling to fluid-structure interaction [441, 443]
  - (h) IPACS: Integrated Phase-Field Advanced Crack Propagation Simulator. An adaptive, parallel, physics-based-discretization phase-field framework for fracture propagation in porous media [431]
6. *Benchmarking:*  
[449, 222]
7. *Research software development:*  
[222, 431, 207, 183]
8. *GAMM Leitartikel:*  
[446]
9. *Lecture notes as educational advancements:*
  - (a) Phase-field fracture lecture notes [300] [partially taken and re-worked in this monograph]
  - (b) [447, specifically Chapters 9, 11–14] [few materials taken in this monograph]