

Researcher Mobility Grant 報告書

< 招聘教授・研究員の情報 / Guest Professor・Guest Scholar >

1. 氏名/Name

Miroslav Kolář

2. 所属機関・職名/Affiliation (Home Organization)・Position

Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Engineering・
Assistant Professor

3. 研究期間（入国日～出国日）/Period of Stay（from the date of entry to departure）

2026 年 7 月 20 日～2026 年 8 月 8 日

4. 専攻/Field of Research

Moving boundary Problems, Applied mathematics

5. ホスト教員氏名と所属学部研究科等/Name of host teacher and affiliation

矢崎成俊, 理工学部・専任教授

6. 講演会の概要（タイトル、日時、場所、参加人数、内容）

※ 20 日間の場合は 2 回分ご記載ください。

/Outline of the lecture (title, date and time, place, number of participants, content)

※If the invitation period is 20 days, please write about two lectures.

(1) “What is the curvature? Bending of curve: basics and application to interface

phenomena”

1st talk on July 21st, 13:30-15:10 (15:20-17:00) within B1 lecture for “calculus” in department of mathematics.

参加人数：50人（Mirek, Yazaki 含む）

NOTE: They just learned the basic differential calculus in 1D, and the curvature in the lecture on the one week before.

1) 30mins. Black board: Basics: Definition of plane curves, local length, arc-length, tangential vector, outward (inward) normal vector, and the curvature

2) 30mins. Photo and movie in slides: Interfacial phenomena in nature and technology

Examples: phase transition (melting), dislocation, smoldering, biology topics, image segmentation,If we want to study Nature or make new technology, we need to recognize,

notice, pay attention and detect of the “interface” between two natural objects, distinguish phases, different materials, etc.

3) 30mins. Both black board and slides: How to describe such interfacial motion. We need “mathematical model”. In many cases, the model is described as ODEs, PDEs, Algorithm, etc. for moving boundary problems in the plane. The curvature plays an important role in MBP.

4) 10mins. Conclusion or message for advanced calculus:

1st degree: tangent → direction of curves

2nd degree (only sign) → shape of curves (convexity)

The curvature → give us more sophisticated information of shape of curves

(2) “Epidemic SEIR model with spatial structure and traffic flow”

2nd talk on July 22nd, 13:30 within B4 seminar of Yazaki laboratory at D215.

参加人数：10人 (Mirek, Yazaki含む)

内容：We modeled individuals as location–activity nodes, explicitly transported epidemic compartments through the network, allowed node populations to evolve dynamically, and incorporated mobility interventions by modifying selected network structures and population groups.

(3) “Application of curvature driven flow on surfaces”

3rd talk on July 22nd, 15:20, Workshop on "Expanding Scope of differential Equations" (研

究会：微分方程式論の拡がり)

<https://sites.google.com/view/yuichida/>

参加人数：7人 (Mirek, Yazaki含む)

内容：We generalized geometric flows preserving surface area to surfaces, established their theoretical properties, developed a fast and robust finite-volume numerical scheme, and demonstrated the importance of suitable tangential velocities, particularly for the KS case.

7. 研究課題、研究概要、研究期間中の活動実績 / Research Theme, Outline, Results

界面現象、画像輪郭抽出、感染症流行モデル、燃焼現象（特に曲面上の燃焼前線の時間発展）、結晶転位のダイナミクスなどについて、議論できた。また、上記3回の講演回の後、研究集会「数学と現象 in 白馬」において、4回目の講演をした。

“What is dislocation? Micro meters world: Experiments and simulations”

4th talk on August 6–8: Mathematics and phenomena in Hakuba

<https://sites.google.com/view/mphakuba2026/>