

**A CLASS OF DOUBLE PHASE PROBLEM WITHOUT
AMBROSETTI–RABINOWITZ-TYPE GROWTH CONDITION:
INFINITELY MANY SOLUTIONS**

BIN GE — YUHANG HAN — QINGHAI CAO — HAIXIN REN

ABSTRACT. This paper concerns with a class of double phase problem without Ambrosetti–Rabinowitz-type growth condition. Under reasonable hypotheses, we establish the existence of infinitely many solutions by using the variant fountain theorems due to Zou [41].

1. Introduction and main results

In recent years, great attention has been paid to the study of certain nonlinear equations, including double-phase operators of the type

$$(1.1) \quad \operatorname{div}(|\nabla u|^{p-2}\nabla u + \mu(x)|\nabla u|^{q-2}\nabla u),$$

where $1 < p < q < N$ and

$$(1.2) \quad \frac{q}{p} < 1 + \frac{1}{N}, \quad \mu: \bar{\Omega} \mapsto [0, +\infty) \text{ is Lipschitz continuous.}$$

2020 *Mathematics Subject Classification*. Primary: 35J60, 35J70; Secondary: 03H10, 35D30.

Key words and phrases. Double phase problem; variational method; Fountain theorem; concave and convex nonlinearities.

This work is supported by the Natural Science Foundation of Heilongjiang Province of China (No. LH2023A007), the National Natural Science Foundation of China (No. 11201095), the Fundamental Research Funds for the Central Universities (No. 3072024GH2402), the Post-doctoral research startup foundation of Heilongjiang (No. LBH-Q14044), the Science Research Funds for Overseas Returned Chinese Scholars of Heilongjiang Province (No. LC201502).